

BOTANICAL HARMONY
DELINEATED :
O R,
APPLICATIONS OF SOME
GENERAL LAWS of NATURE
T O
P L A N T S,

ILLUSTRATED WITH PLATES.

BY

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DE SAINT PIERRE.

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..... MISERIS SUCCURRERE DISCO.

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FIRST AMERICAN EDITION.

WORCESTER :

PRINTED FOR J. NANCREDE, No. 49, MARLBOROUGH STREET, BOSTON.

1797.



P R E F A C E.

THE publick are here presented with the Eleventh of STUDIES OF NATURE, by ST. PIERRE, in a separate Volume, which treats of the HARMONIES OF PLANTS, and has no necessary connexion with the rest of the work. It notices what appear to the Author essential defects, in the general mode of pursuing Botanical Science ; and suggests remedies for them in other methods of studying vegetable nature. He sets out with representing his ideas of the faults of the system by which researches in this field of knowledge are principally guided. In consequence of plants being classed according to their florification, natural order is often violated ; and those, which have different and opposite characters, are brought under the same denomination. The names used to denote the classes,

are taken from the ancient languages and often compounded ; so that Botanical systems are incapable of a just translation. The descriptions, employing words very indefinite, and necessarily exhibiting the characters of vegetables in succession, are insufficient to produce accurate or complete ideas. Hence it happens, that a person may be thoroughly versed in the description of skilful Botanists, and yet be unable to distinguish, by means of them, a plant in the field which has not previously been seen ; and when it is distinguished, may be unacquainted with its most interesting properties and relations.

THE ingenious and sprightly author of the following Treatise, proposes to remedy these defects, by classing vegetables, not by their florifications only, but by the relations of their several parts to the rest of nature, to the elements, to each other, to animals, and to man ; and to describe them by referring the colours, forms, flavours, smells and other characters of those which are unknown, to those of plants or other objects, which are known. Thus he aims to make the knowledge of Botany consist in the knowledge of

what is useful and interesting, in the vegetable kingdom ; by simplifying the science to adapt it to the capacities of the less learned ; and to render it more effectually subservient to the common purposes of life, to arts, agriculture and medicine ; to the advancement of our knowledge, admiration and love of the AUTHOR of the world.

IN unfolding the relations, or, as he denominates them, the HARMONIES OF PLANTS, the same marks of wise and benevolent design appear in this department of nature, which distinguish the other works of God. We are pointed to a Final Cause in every thing relative to the structure and situation of a plant. The flower, the leaves, the fruit, the stem, the root, the colour, the form, and the sight, are shown to be contrived and executed in conformity to the laws of harmony and utility. According to the view of the loveliest kingdom of Nature in this work, whilst the flowers serve as mirrors to reflect the heat of the sun upon the parts of fecundation, or as parasols, to shelter them from its violence, the leaves are variously formed to receive or to repel moisture, according as it is

useful or injurious ; and to denominate the proper situation of the plant, as it belongs to the mountain, the plain, or the water. Whilst the fruits, or seeds, are shaped to facilitate their reproduction, formed to be wafted by the winds, or carried on the stream, the stems have relations to the winds, which agitate them ; and the roots are suited to the kind of soil destined for their support. We are invited to trace the harmonies of vegetables with each other ; to observe the beautiful contrast created by the diversities of form and colour in those which grow together ; how, for instance, the birch spreads its pendant and waving foliage near the erect stately fir ; the humble mistletoe is attached to the towering oak..... We are presented with a sketch of the animal harmony of vegetables, which appear in the evident designation of every plant, to give protection or sustenance to one or more species of the inferior creatures. And we are referred to the wonderful subserviency of this part of nature to man ; so that not a species of vegetable is found, which does not somewhere, or some how, contribute to his clothing, or food, his shelter, pleasure, medicine, or fuel.

It is believed that this volume is calculated to afford valuable instruction and high entertainment. New, without being visionary, and philosophical as it is interesting, it is suited both to amuse the superficial and teach the profound ; to open an extensive field of research to the inquisitive ; and furnish powerful incitements to the devotion of the pious.

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BOTANICAL HARMONY, DELINEATED.

APPLICATIONS OF SOME GENERAL LAWS OF NATURE TO PLANTS.

BEFORE I proceed to speak of plants, I must be indulged in making a few reflections on the language of Botany.

We are still so young in the study of Nature, that our languages are deficient in terms to express her most common harmonies. This is so true, that however exact the descriptions of plants may be, and compiled by Botanists of whatever ability, it is impossible to distinguish them in the fields, unless you have previously seen them in Nature, or, at least, in an herbary. Persons, who think they have made the greatest proficiency in Botany, need only attempt to draw on paper a plant which they have never seen, after the description of the most accurate Master, to be convinced how widely the copy deviates from the original.

Men of genius have, nevertheless, taken inexpressible pains to assign characteristic names to the different parts of plants. They have even borrowed most of those names from the Greek, a language of singular energy of expression. From this has resulted another inconveniency; it is, that those names, being for the most part compounds, cannot be rendered into modern language; and for this reason it is that a great part of the Works of *Linnaeus* are absolutely incapable of translation. These learned and

mysterious expressions; no doubt, diffuse a venerable air over the study of Botany; but Nature has no need of such resources of human art to attract our respect. The sublimity of her Laws can easily dispense with the emphasis and obscurity of our expressions. The more light a man carries in his own bosom, the more wonderful he esteems it to be.

After all, most of those foreign names, employed particularly by the herd of Botanists, do not so much as express the most common characters of vegetables. They frequently make use, for example, of such vague expressions as these, *suavè rubente*, *suavè olente*, of an agreeable red, sweet smelling, in order to characterize flowers; without expressing the shade of red, or the species of perfume. They are still more embarrassed, when they wish to convey the dusky colours of the stem, of the root, or of the fruit: *Atro rubente*, say they, *fusco nigrescente*, of a dark red, of a dusky brown. As to the forms of vegetables, the case is still worse, though they have fabricated terms compounded of four or five Greek words to describe them.

J. J. Rousseau communicated to me, one day, a set of characters somewhat resembling the algebraic, which he had invented for the purpose of briefly expressing the colours and forms of vegetables. Some of them represented the forms of the flowers; others, those of the leaves; others, those of the fruits. Some resembled a heart, some were triangular, some of the lozenge shape. He did not employ above nine or ten of those signs, to compose the expression of one plant. Some he placed above others, with cyphers which indicated the genera and the species of the plant, so that you would have taken them for the terms of an algebraic formula. However ingenious and expeditious this method might be, he informed me that he had given it up, because it presented to him skeletons only.

This sentiment came with peculiar grace from a man whose taste was equal to his genius, and may suggest some reflections to those who are for giving abridgments of every thing, especially of the Works of Nature. The idea of *John James*, however, well deserves to be followed up, should it only serve to produce, one day, an alphabet proper to express the language of Nature. All that seems requisite is the introduction of accents, to convey the shades of colours, and all the modifications of flavours, perfumes and forms. After all, those characters could not be delineated with perfect precision, unless the qualities of each vegetable are first exactly determined by words: Otherwise the language of Botanists, which is now accused of speaking only to the ear, would make itself intelligible only to the eye.

This is what I have to propose respecting an object so highly interesting, and which will perfectly coalesce with the general principles which we shall afterwards lay down. The little which I may advance on the subject will serve to supply expression, not only in Botany, and in the study of the other natural Sciences, but in all the Arts, where we find ourselves puzzled every instant, for want of terms to convey the shades and forms of objects.

Though we have only the term *white*, whereby to express the colour which bears that name, Nature presents to us a great variety of sorts of it. Painting, with respect to this article, is as barren as language.

I have been told of a famous Painter of Italy, who, upon a certain occasion, found himself very much embarrassed how to represent, in one of his pieces, three figures dressed in white. The point in question was, to give effect to those figures, to be thus uniformly dressed, and to draw out different shades of the most simple, and the least compounded, of all colours. He was going to abandon his object as a thing impossible, when, happening to pass through a corn market, he perceived the effect which he was in quest of. It was a group formed by three millers,

one of whom was under a tree, the second in the half tint of the shade of that tree, and the third exposed to the rays of the Sun : So that though the drapery of all the three was white, they were completely detached from each other. He introduced a tree, therefore, amidst the three personages of his picture, and, by illuminating one of them with the rays of the Sun, and throwing over the other two different tints of shade, he was enabled to exhibit a drapery of three several casts of white.

This, however, was rather to elude the difficulty, than to resolve it. And this is, in fact, what Painters do in similar cases. They diversify their whites by shades, half tints and reflexes ; but these whites are not pure ; they are always disturbed with yellow, blue, green or gray. Nature employs several species of white, without diminishing the purity of it, by dotting, rumpling, radiating, varnishing it, and in various other ways.....Thus, the whites of the lily, of the daisy, of the lily of the valley, of the narcissus, of the anemone nemorosa, of the hyacinth, are all different from each other. The white of the daisy has something of that of a shepherdess's cornet ; that of the hyacinth has a resemblance of ivory ; and that of the lily, half transparent and chrySTALLINE, resembles the paste of porcelain. I believe, therefore, that all the whites, produced by Nature, or by Art, might be referred to those of the petals of our flowers. We should thus have, in vegetables, a scale of shades of the purest white.

We might, in like manner, procure all the pure and imaginable shades of yellow, of red and of blue, from the flowers of the jonquil, of the saffron, of the butter flower of the meadow, of the rose, of the poppy, of the blue bottle, of the cornfield, of the larkspur and so on. We might find, in the same manner, among our common flowers, all the compound shades, such as those of the impurpled violet and foxglove, which are formed of the various harmonies of red and blue. The single compound colour, made up of blue and yellow, which constitutes the green of our

herbage, is so varied in every plain, that each plant, I may venture to affirm, has its peculiar shade of that colour. I can have no doubt that Nature has displayed, in equal variety, the other colours of her palette, in the bosom of flowers, or on the surface of fruits.

In performing this, she sometimes employs very different tints, without confounding them; but she lays them on one above another, so that they form the dove's neck: Such is the beautiful shag which garnishes the corola of the anemone; in other cases, she glazes their surface, as certain mosses with a green ground, which are glazed over with purple; she velvets others, such as the pansy; she powders over some fruits with a delicately fine flour, such as the purple plumb, distinguished by the addition of *de Monsieur*; or invests them with a light down to soften their vermillion, as the peach; or smooths their skin, and gives the brightest lustre to their colours, as to the red of the apple of Calleville.

What embarrasses Naturalists the most, in denominating colours, is to find distinctive epithets for such as are dusky; or rather, this gives them no manner of concern: For they evade the difficulty by the vague and indecisive expressions, of blackish, gray, ash coloured, brown, which they convey, it is true, in Greek and Latin words. But those words frequently answer no purpose, except to confound their images, by giving no representation whatever; for what, in good earnest, is meant by these, and such like epithets, *atro purpurante*, *fusco nigrescente*, which they employ so frequently?

It is possible to make thousands of tints widely different from each other, to which such general expressions might be applied. As those dark shades, in truth, are much compounded, it is exceedingly difficult to characterize them by the phraseology of our common vocabularies. But this might be easily and effectually accomplished, by referring them to the different colours of our domestic vegetables. I have remarked in the barks of our trees and

shrubbery, in the capsules and shells of their fruits, as well as in the dead leaves, an incredible variety of those sad and gloomy shades, from yellow down to black, with all the intermixtures and accidents of the other colours. Thus, instead of saying in Latin, a yellow inclining to black, or an ash coloured tint, in order to determine some particular shade of colour in a production of Art, or of Nature, we might say a yellow of the colour of a dried walnut, or a gray like the bark of a beech tree.

Those expressions would be so much the more exact, that Nature invariably employs such tints in vegetables, as determining characters and indications of maturity, of vigor, or of decay; and that our peasantry can distinguish the different species of wood in the forests by inspection of their bark simply. Thus, not Botany alone, but all the Arts, might find, in vegetables, an inexhaustible dictionary of unvarying colours, which would not be embarrassed with barbarous and technical compound words, but which would continually present new images. Our books of Science would thence derive much pleasing vivacity, from being embellished by comparisons and expressions borrowed from the loveliest kingdom of Nature.

The great Poets of Antiquity carefully availed themselves of this, by referring most of the events of human life to some appearance of the vegetable kingdom. Thus *Homer* compares the fleeting generations of feeble mortals to the leaves which drop from the trees of the forest, at the end of Autumn; the freshness of beauty to that of the rose; and the paleness which overspreads the countenance of a young man wounded to death in battle, as well as the attitude of his drooping head, to the colour and the fading of a lily, whose root has been torn up by the plough. But we satisfy ourselves with repeating the expressions of men of genius, without daring to tread in their footsteps. This, however, is not the worst, for most Naturalists consider the colours themselves of vegetables as accidents simply. We shall presently see under what a grievous

mistake they labour, and how widely they have deviated from the sublime plans of Nature, by persisting in a prosecution of their mechanical and systematic methods.

It is possible, in like manner, to trace an approximation of flavours and smells of every species, and of every country, to those of the plants of our gardens and of our fields. The ranunculus of the meadow has the acridity of the Java pepper. The root of the caryophyllata, or holy thistle, and the flower of the pink, smell like the clove of Amboyna. As to compound flavours and smells, they may be referred to such as are simple, the elements of which Nature has scattered over all climates, and which she has united in the class of vegetables. I know a species of morel, used as food by the Indians, which, when boiled, has the taste of beef. They call it *brette*. There is a species of the cranebill, the leaf of which resembles, in smell, a roasted leg of mutton. The muscari, a species of small hyacinth, which grows among shrubbery early in the Spring, smells very strongly of the plumb. Its small monopetalous flowers, of a delicate blue colour, and with lips or incisions, have likewise the form of that fruit.

By approximations such as these, the English Navigator *Dampier*, and Father *du Tertre*, have given us, as far as I can judge, the most accurate notions of the fruits and flowers which grow between the Tropics, by referring them to the fruits and flowers of our own climates. *Dampier*, for example, in order to describe the banana, compares it, when stripped of its thick five panned skin, to a large sausage; its substance and colour to fresh butter in Winter; its taste, a mixture of apple and of the pear known by the name of the good christian, which melts in the mouth like marmalade. When this traveller describes some good fruit of the Indies, he sets your mouth watering. He possesses a naturally sound understanding, superior, at once, to the methodical trammels of the learned, and to the prejudices of the vulgar. He maintains, for instance, and with truth on his side, in opposition to the

opinion of most navigators, that the plantain, or banana, is the king of fruits; without excepting even the cocoa. He informs us, that this is likewise the opinion of the Spaniards, and that multitudes of families live, between the Tropics, on this pleasant, wholesome, and nourishing fruit, which lasts all the year round, and stands in no need of any of the arts of cookery.

Father *du Tertre* is not less happy, nor less accurate, in his botanical descriptions. These two travellers give you, at a single stroke, by means of trivial similitudes, a precise idea of a foreign vegetable, which you would search for to no purpose in the Greek names of our first rate Botanists. This mode of describing Nature, by ordinary images and sensations, is held in contempt by the learned; but I consider it as the only one capable of exhibiting pictures, that have a resemblance, and as the true character of genius. With such assistance, you will be enabled to paint every natural object, and may dispense with methods and systems; without it you will only coin phrases.

Let us now suggest a few thoughts respecting the form of natural objects. It is here that the language of Botany, and even those of the other Arts, are peculiarly barren. Geometry, whose particular object this is, has invented scarcely more than a dozen of regular curves, which are known to only a small number of the learned; and Nature employs an infinite multitude of them in the forms of flowers alone. Some of the uses of these we shall presently indicate. Not that I mean to make of a study prolific of delight, a sublime Science, worthy only of the genius of a *Newton*. As Nature has introduced, in my opinion, not only the colours, the flavours and the perfumes, but likewise every model of form into the leaves, the flowers and the fruits of all climates, whether in trees, in herbage, or in mosses; the vegetable forms of other parts of the World, might be referred to those of our own country which are most familiar to us. Such approximations would be much more intelligible than Greek com-

pound words, and would manifest new relations in the different classes of the same kingdom.

They would be no less necessary for expressing the aggregations of the flowers on their stems, of the stems round the root, and the groups of young plants around the parent plant. It may be affirmed, that the names of most of these vegetable aggregations and dispositions are yet to be invented; the greatest Masters not having been fortunate in characterizing them, or, to speak without reserve, not having made it any part of their study. For example, when *Tournefort** speaks, in his Voyage to the Levant, of a heliotrope of the Isle of Naxos, which he characterizes thus, *heliotropum humifusum, flore minimo, semine magno*, the creeping heliotrope, with a very small flower and a large seed; he says that it has its flowers disposed in form of an ear of corn, going off in a scorpion's tail. There are two mistakes in this description; for the flowers of this heliotrope, similar, from their aggregation, to the flowers of the heliotrope of our climates, and to that of Peru, are not disposed in form of an ear of corn, for they are arranged on a horizontal stem, and only on one side; and they bend downward, like the tail of a snail, and not upward, like the tail of a scorpion.

The same inaccuracy, in respect of image, is to be found in the description which he gives us of the *Stachis Cretica latifolia*, the broad leaved stachis of Crete: Its flowers, says he, are disposed in rings. No one can imagine he intends to convey this meaning, that they are disposed like the divisions of the king of the chess board. Under this form, however, they are represented in the drawing of *Aubriet*, his designer. I do not know any botanic expression which conveys this character of spherical aggregations, in separate stories of alternate swellings and sinkings, and terminating in a pyramid. *Barbeau du Bourg*, who possesses much imagination with little exactness, calls

* *Tournefort's Voyage to the Levant*, vol. i.

this form verticillate, for what reason I know not. If it is from the Latin word *vertex*, head or summit, because these flowers, thus aggregated, form several summits, this denomination would be more applicable to several other plants; and, besides, does not express the swellings, the sinkings, and the progressive diminution of the flowers of the stachis.

Tournefort derives it from the Latin word *verticillus*; that is, says he, a small weight perforated circularly to receive the end of a spindle, in order to make it whirl with greater facility. This is going a great way, in quest of a very imperfect similitude, to an utensil by no means generally known. In saying this, however, I would not be considered as failing in the respect which is due to such a man as *Tournefort*, who first cleared for us the botanic path, and was, besides, a person of profound erudition. But from this carelessness of the great Masters, we may form a judgment of the vague, inaccurate, and incoherent expressions which fill the vocabulary of Botany, and diffuse obscurity over its descriptions.

After all, I shall be asked, How would you characterize the aggregation of the flowers of the two plants which have just been mentioned? By referring them to aggregations similar to those of the plants of our climates. In this there can be no difficulty: Thus, for example, we might refer the assemblage of the flowers of the Grecian heliotrope, to that of the French, or Peruvian heliotrope: And that of the flowers of the Cretan stachis, to that of the flowers of the horehound, or of the pennyroyal. To this might afterwards be added the differences in colour, smell, flavour, which diversify the species of it. There is no occasion to compound foreign terms to describe forms which are familiar to us. Nay, I defy any one to convey by Greek and Latin words, and with the most learned turn of periphrasis, the simple colour of a bark of a tree. But if you tell me it resembles that of an oak; I have the shade of it at once.

These approximations of plants have this farther utility, that they present us with the combined whole of an unknown object, without which we can form no determinate idea of it. This is one of the defects of Botany, it exhibits the characters of vegetables only in succession; it does not collect them, it decomposes them. It refers them, indeed, to a classical order, but not to an individual order. This, however, is the only one which the weakness of the human mind permits us to catch. We love order, because we are feeble, and because the least confusion disturbs us; now, there is no order which we can adopt more easily than that which approaches to an order which is familiar to us, and which Nature is every where presenting. Try to describe a man, feature by feature, limb by limb; be ever so exact, yet you never will be able to give me his portrait: But if you refer him to some known personage; if you tell me, for example, that he is of the make and mien of a Don Quixote; or with a nose like that of St. Charles Baromeo, and so on, and you paint me his picture in four words. It is to the whole of an object that the ignorant, an epithet which includes the greatest part of Mankind, attach themselves in the first instance, in order to acquire the knowledge of it.

It would, therefore, be of essential importance to have, in Botany, an alphabet of colours, favours, smells, forms and aggregations, derived from our most common plants. Those elementary characters would enable us to express ourselves exactly in all the parts of Natural History, and to present to ourselves relations equally new and curious.

In hope that persons of superior intelligence may hereafter be induced to take up the subject, I proceed to the discussion of it with what ability I have, notwithstanding the embarrassment of language.

When we see a multitude of plants, of different forms, vegetate on the same soil, there is a disposition to believe, that those of the same climate grow indifferently every where. But those only which are produced in places

particularly assigned to them by Nature, attain there all the perfection of which they are susceptible. The same thing holds good with respect to animals. Goats are sometimes reared in marshy places, and ducks on the mountains; but the goat never will acquire, in Holland, the beauty of that which Nature clothes with silk on the rocks of Angora; nor will the duck of Angora ever attain the stature and the colours of those which are to be found in the canals of Holland.

If we throw a simple glance on plants, we shall perceive that they have relations to the elements which promote their growth; that they have relations to each other, from the groups which they contribute to form; that they have relations to the animals which derive nourishment from them; and, finally, to Man, who is the centre of all the Works of Creation. To these relations I give the name of harmonies, and I divide them into elementary, into vegetable, into animal and into human.

By proposing this division, I shall reduce to something like order the disquisition on which I am going to enter. It cannot be supposed that I should examine them in detail: those of a single species would furnish speculations, which the application of a whole life could not exhaust; but I shall unfold enough of their general harmonies to produce conviction, that an infinite Intelligence reigns in this amiable part of Creation, as in the rest of the Universe.

We shall thus make application of the Laws which we have previously established, and shall take a glimpse of a multitude of others, equally worthy of research, and equally calculated to excite admiration. Reader, be not astonished at either their number, or their extent. Let this great truth be deeply impressed on thy heart: *GOD has made nothing in vain!* A scholar, with his systems and methods, finds himself stopped short in nature every step he takes; while furnished with this as a key, the ignorant rustic is able to unlock every door of knowledge.

ELEMENTARY HARMONIES OF PLANTS.

Plants have as many principal parts as there are elements with which they keep up a relation. By their flowers, they stand related to the Sun, which fecundates their seeds, and carries them on to maturity; by their leaves, they are related to the waters, which bedew them; by their stems, to the winds which agitate them; by their roots, with the ground which sustains them; and by their grains, with their situations adapted to their growth and increase. Not that these principal parts have no indirect relations besides to the other elements, but it will be sufficient for our purpose to dwell on such as are immediate.

Elementary Harmonies of Plants with the Sun, by the Flowers.

Though Botanists may have made great and laborious researches respecting plants, they have paid no attention to any of those relations. Fettered by their systems, they have attached themselves to the consideration of them, particularly on the side of the flowers: and have arranged them in the same class, wherever they found these external resemblances without so much as enquiring what might be the particular use of the florification. They have, indeed, distinguished in it the stamina, the antheræ, and the stigmata, for the fecundation of the fruit, but, excepting this, and some others, which respect the interior organization, they have neglected, or misunderstood, the relations which the whole plant has with the rest of Nature.

This partial division has led them into the strangest confusion; for, by considering the flowers as the princi-

pal characters of vegetation, and by comprehending in the same class those which were similar, they have united plants entirely foreign to each other, and have separated, on the contrary, many which are evidently of the same genus. Such is, in the first case, the fuller's thistle, called *dipsacus*, which they class with the scabious, because of the resemblance of some parts of its flower; though it presents in its branches, its leaves, its smell, its seed, its prickles, and the rest of its qualities, a real thistle: And such is, in the second, the great chefnut of India, which they exclude from the class of chefnut trees, because it has different flowers. To class plants from the flowers, that is, from the parts of their fecundation, is the same thing with classing animals from those of generation.

However, though they have referred the character of a plant to its flower, they misunderstand the use of its most shining part, which is that of the corolla. They call that the corolla, which is, in common language, denominated the leaves of a flower. It is a Latin word, signifying a little crown, from the disposition of the leaves, in many species, in the form of coronets, and they have given the name of petals to the divisions of that crown. Some, in truth, have acknowledged it to be properly adapted for covering the parts of fecundation before the expansion of the flower; but its calix is much better adapted to this purpose, from its thickness, from its beards, and sometimes from the prickles with which it is invested. Besides, when the corolla leaves the stamina exposed, and when it continues fully blown for whole weeks, it must of necessity be answering some other purpose; for Nature does nothing in vain.

The corolla seems intended to reverberate the rays of the Sun on the parts of fecundation; and we shall be put beyond the reach of doubt as to this, if we consider the colour and the form of it in most flowers. It has been remarked in the preceding Study, that of all colours, white is the most proper for reflecting the heat: Now, it

is, in general, that which Nature bestows on the flowers that blow at cold seasons and in cold places, as we see is the case in the snow drop, the lily of the valley, the hyacinth, the narcissus, and the anemone nemerosa, which come into flower early in the Spring. We must likewise assign to this colour such as have slight shades of the rose and of the azure, as many hyacinths; as well as those which have yellow and shining tints, as the flowers of the dandelion, the butter flower of the meadow, and the wall gillyflower. But such as blow at warm seasons, and in warm situations, as the cockle, the wild poppy, and the blue bottle, which grow in Summer amongst the corn, are dressed in strong colours, such as purple, deep red, and blue; for these absorb the heat without greatly reflecting it.

I do not know, however, that there are any flowers entirely black; for in that case, its petals, destitute of all power of reflection, would be entirely useless. In general, of whatever colour a flower may be, the under part of its corolla, which reflects the rays of the Sun, is of a much paler tint than the rest. This is so very remarkable, that Botanists, who generally consider the colours of flowers as accidents merely, distinguish it by the name of *unguiculus* (a little nail.) The ungucle is that with relation to the flower which the belly is with relation to animals: Its shade is always clearer than that of the rest of the petal.

The forms of flowers are no less adapted than their colours to reflect the heat. Their corollæ, divided into petals, are only an assemblage of mirrors directed toward one focus. Of these they have sometimes four, which are plain, as the flower of the colewort in the cruciform; or a complete circle, as the daisy in the class of radiated; or spherical portions, as the rose; or entire spheres, as the bells of the lily of the valley; or cones mutilated, as the foxglove, the corolla of which is formed like a sewing thimble.

Nature has placed, at the focuses of these, plain, spherical, elliptical, parabolic, and other mirrors, the parts of

the fecundation of plants, as she has placed those of generation in animals, in the warmest parts of their bodies. These curves, which Geometricians have not yet examined, merit their most profound researches. Is it not astonishing, that they should have bestowed such learned pains to find out curves altogether imaginary, and frequently useless; and that they should have neglected to study those which Nature employs so regularly, and in such variety, in an infinite number of objects? Be this as it may, Botanists have given themselves still less trouble about the matter. They comprehend those of flowers under a small number of classes, without paying the slightest attention to their use, nay, without so much as apprehending that they could have any. They confine themselves entirely to the division of their petals, which frequently change nothing of the configuration of their curves; and they frequently class under the same name those which are the most opposite. Thus, under the general designation of the *monopetalous*, (those that have a single petal) they include the spheroid of the lily of the valley, and the trumpet of the convolvulus.

On this subject, a very remarkable circumstance claims our notice; namely, that, frequently, such as is the curve formed by the border, or upper extremity of the petal, such too is the plan of the whole petal itself; so that Nature presents to us the cut or shape of each flower in the contour of its petals, and gives us at once, its plan and its elevation. Thus roses, and the whole tribe bearing this denomination, have the border of their petals in sections of a circle, like the curve of the flowers themselves; the pink and blue bottle, which have their selvage notched, present the plans of their flowers plaited up like fans, and form a multitude of focuses.

For want of the real flower, these curious remarks may be verified from the drawings of Painters who have been the most exact in copying plants, but who are indeed very few in number. Such is, among those few, *Aubriet*, who

has drawn the plants of *Tournefort's* voyage to the Levant,* with the taste of a Painter, and the precision of a Botanist. You may there see the confirmation of what I have just been advancing. For example, the *scorzonera Græca saxatilis* & *maritima foliis variè laciniatis*, (the Greek saxatile and marine scorzonera, with leaves variously scolloped) which is there represented, as its petals, or half flowers, squared at the extremity, and plane in their surface. The flower of the *stachis Cretica latifolia*, (the broad leaved stachis of Crete) which is a monopetalous tubular plant, has the upper part of its corolla undulated, as well as its tube. The *campanula Græca saxatilis jacobææ foliis*, (the Greek bell flower of the rocks, with ragwort leaves) presents these consonances in a manner still more striking. This campanula, which *Tournefort* considers as the most beautiful he had ever seen, and which he sowed in the Royal Garden at Paris, where it succeeded very well, is of the pentagonal form. Each of its faces is formed of two portions of a circle, the focuses of which, undoubtedly, meet on the same anthera; and the border of this campanula is notched into five parts, each of which is likewise cut into the form of a Gothic arch, as each subdivision of the flower is. Thus, in order to know, at once, the curve of a flower, it is sufficient to examine the brim of its petal.

It is of much utility to attend to this observation, for otherwise it would be extremely difficult to determine the focuses of the petals. Besides, flowers lose their internal curves in herberies. I believe these consonances to be general; I presume not however, to assert, that they admit of no exceptions. Nature may deviate from this order, in some species, for reasons which I know not. It cannot be too frequently repeated; She has no general and unvarying Law, except the accommodation of beings endowed with sensibility. The relations just now suggest-

* *Tournefort's* Voyage to the Levant, vol. i.

ed, between the curve of the brim and that of the petal, seem, beside, to be founded on this universal Law, as they present conformities of such agreeable approximation.

The petals appear to such a degree destined to warm the parts of fecundation, that Nature has placed a circle of them around most compound flowers, which are themselves aggregations of small tubes, infinite in number, that form so many particular flowers, or, if you will, flowrets. This is obviously remarkable in the petals which surround the disks of daisies and sunflowers. They are likewise to be met with around most of the umbelliferous plants : Though each flowret, which composes them, has its particular petals, there is a circle of others still greater, which encompasses their assemblage, as you may see in the flowers of the daucus.

Nature has still other means of multiplying the reflexes of heat in flowers. Sometimes she places them on stems of no great elevation, in order to collect warmth from the reflections of the Earth ; sometimes she glazes over their corollæ with a shining varnish, as the yellow meadow ranunculus, known by the trivial name of butter flower. Sometimes she withdraws the corolla, and makes the parts of fecundation to shoot from the partition of an ear, of a cone, or of the branch of a tree. The forms of the spike, and of the cone, appear to be the best adapted for reverberating on them the action of the Sun, and to ensure their fructification ; for they always present some one side or another sheltered from the cold. Nay, it is very remarkable, that the aggregation of flowers, in a conical and spike form, is very common to herbs and to trees of the North, and rarely to be found in those of the South. Most of the gramineous plants which I have seen in southern Countries, do not carry their grains in a spike, or closely compacted ear, but in flowing tufts, and divided into a multitude of particular stems, as the millet and rice. The maize, or Turkey corn, I admit, bears its grains in a large ear ; but that ear is for a considerable time shut up in a

bag ; and on bursting from it, pushes away over its head a long covering of hair, which seems entirely destined to the purpose of sheltering its flowers from the heat of the Sun.

Finally, what confirms me in the belief, that the flowers of plants are adapted to the action of heat, conformably to the nature of every climate, is this, that many of our European plants vegetate extremely well in the Antilles Islands, but never come to seed there. Father *du Tertre* observed, that in those islands,* the cabbage, the fainfoin, the lucern, the favory, the sweet basil, the nettle, the plantain, the wormwood, the sage, the liverwort, the amaranth, and all our species of gramineous plants, throve there wonderfully well, but never produced grains. These observations demonstrate, that it is neither the air, nor the soil, which is inimical to them ; but the Sun, which acts with too much vivacity on their flowers, for most of these plants have theirs aggregated into an ear, which greatly increases the repercussion of the solar rays.

I believe, at the same time, that such plants might be naturalized in the Westindia Islands, as well as many others of our temperate climates, by selecting from the varieties of their species, those whose flowers have the smallest fields, and whose colours are the deepest, or those whose pannicles are divergent.

Not that Nature has no other resources except such as these, to make plants of the same genus attain perfection in different seasons and climates. She can render their flowers capable of reflecting the heat, in different degrees of Latitude, without any very sensible alteration of the form. Sometimes she mounts them on elevated stems, to remove them from the influence of the reflection of the ground. It is thus she has placed, between the Tropics, most of the apparent flowers upon trees. I have seen but few there in the meadows, but a great many in the forests.

* Natural History of the Antilles, by Father *du Tertre*.

In those countries, you must look aloft, in order to have a sight of flowers ; in our native climes, we must cast our eyes on the ground, for this purpose ; for with us flowers grow on herbage and shrubbery. Sometimes she expands them under the shade of leaves ; such are those of the palm tree, of the banana, and of the *jacquier*, which grow close to the trunk of the tree. Such, likewise, are, in our temperate climates, those large white bell formed flowers, known by the name of Lady's smock, which delight in the shade of the willow.

There are others, such as most part of the convolvuluses, which expand only in the night ; others grow close to the ground, and exposed, as the pansy, but their drapery is dusky and velveted. There are some which receive the action of the Sun when at a considerable height, as the tulip ; but Nature has taken her precautions so exactly, as to bring out this stately flower only in the Spring, to paint its petals with strong colours, and to daub the bottom of its cup with black.* Others are disposed in giran-

* This flower, from its colour, is, in Persia, the emblem of perfect lovers. *Chardin* tells us, that, when a young Persian presents a tulip to his mistress, it is his intention to convey to her this idea, that, like this flower, he has a countenance all on fire, and a heart reduced to a coal. There is no one Work of Nature, but what awakens in man some moral affection. The habits of society insensibly efface, at length, the sentiment of it ; but we always find it in vigor among Nations who still live near to Nature.

Many alphabets have been imagined in China, in the earlier ages, after the wings of birds, fishes, shells and flowers : Of these, very curious characters may be seen in the China illustrated of *Father Kercher*. It is from the influence of those natural manners, that the Orientals employ so many similitudes and comparisons in their languages. Though our metaphysical eloquence makes no great use of them, they frequently produce, nevertheless, a very striking effect. *J. J. Rousseau* has taken notice of that which the Ambassador of the Scythians proposed to *Darius*. Without speaking a word, he presented him with a bird, a frog, a mouse and five arrows.† *Hierodotus* relates, that the same *Darius* sent word to the Greeks of Ionia,

† *Darius*, at first, understood this as a complete surrender of Scythian independence into his hands ; but the event instructed him, that this high spirited people intended to convey a bold defiance : " Unless you can fly as a bird, dig as a mouse, swim as a frog, our arrows shall reach you."

B. H.

doles, and receive the effect of the solar rays only under one point of the compass. Such is the girandole of the lilach, which pointing with various aspects, to the East, to the South, to the West and to the North, presents, on the same cluster, flowers in bud, half open, fully blown, fading, and all the delightful shades of the florification.

There are flowers, such as the compound, which being in a horizontal position, and completely exposed, behold the Sun, like the Horizon itself, from his rising to his setting; of this description is the flower of the dandelion. But it possesses very peculiar means of sheltering itself from the heat: It closes entirely whenever the heat becomes excessive. It has been observed to open, in Summer, at half an hour after five in the morning, and to collect its petals toward the centre, about nine o'clock. The flower of the garden lettuce, which is, on the contrary, in a vertical plane, opens at seven o'clock, and shuts at ten.

From a series of similar observations it was, that the celebrated *Linnaeus* had formed a botanical time piece; for he had found plants which opened their flowers at every hour of the day, and of the night. There is cultivated in the King's Garden, at Paris, a species of serpentine aloes, without prickles, whose large and beautiful flower exhales a strong odour of the vanilla, during the time of its expansion, which is very short. It does not blow till toward the month of July, and about five o'clock in the evening: You then perceive it gradually open its petals, expand them, fade and die. By ten o'clock of the same night, it is totally withered, to the great astonishment of the spectators, who flock in crowds to the sight; for what

who were laying waste the country, that if they did not give over their depredations, he would treat them like pines. The Greeks, who by this time had become infected with wit, and had proportionally begun to lose sight of Nature, did not comprehend the meaning of this. Upon enquiry, they at length discovered that *Darius* meant they should understand it to be his resolution utterly to exterminate them; for the pine tree, once cut down, shoots out again no more.

is uncommon is alone admired. The flower of our common thorn, I do not mean that of the white thorn, is still more extraordinary ; for it flowers so rapidly, that there is scarce time to observe its expansion.

These observations, taken in their connexion, clearly demonstrate the relations of the corollæ to the heat of the Sun. To all those which have gone before, I shall subjoin one more, by way of conclusion, which evidently proves the use for which they are intended ; it is this, The duration of their existence is regulated by the quantity of heat which it is their destination to collect. The hotter it is, the shorter is their duration. They almost all drop off as soon as the plant is fecundated.

But if Nature withdraws the greatest number of flowers from the too violent action of the Sun, she destines others to appear in all the lustre of his rays, without sustaining the least injury from them. On the first she bestows dusky reflectors, or such as can close themselves as occasion requires ; she provides others with parasols. Such is the crown imperial, whose flowers, like a bell inverted, grow under the shade of a tuft of leaves. The chrysanthemum peruvianum, or to employ a better known term, the turnsol, which turns continually toward the Sun, covers itself, like Peru, the country from which it comes, with dewy clouds, which cool and refresh its flowers, during the most violent heat of the day. The white flower of the lychnis, which blows in our fields, in Summer, and presents, at a distance, the resemblance of a Maltese cross, has a species of contraction, or narrow collar, placed at its centre, so that its large shining petals turned back outwardly, do not act upon its stamina. The white narcissus has, in like manner, a small tunnel. But Nature stands in no need to create new parts, in order to communicate new characters to her Works. She deduces them, at once, from existence and from nonexistence ; and renders them positive, or negative, at her pleasure. She has given curves to most flowers, for the purpose of collecting the



REVERBERATING

5. In horizontal

Plans

6. Or Parabolic

4. Elliptic

3. Spheric

5. The Daisy



6. The Nun
of Peru



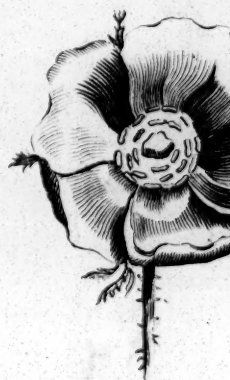
11. The Blue Bottle

4. The Tulip



10. The Imperial

3. The Simple



9. Pea Blossom

11. In unequal Plans

10. In the Ellipse inverted

9. In the Sphere folded

PARASOL FLO

ATING FLOWERS

2. Conic

1. Perpendicular

Simple Rose



2. Convolvulus of the Day



1 Ear of Corn



Blossom



8 Convolvulus of the Night



7. Ear of Rice

where folded inwards

8. In a Cone closed.

7. Divergent

L FLOWERS

ede N^o 49 Marlbro' Street Boston.

Rollinson sc^t N York.

heat at their centre : She employs the same curves, when she thinks proper, in order to dissipate the heat : She places the focuses of them so as to act outwardly. It is thus that the petals of the lily are disposed, which are so many sections of the parabola. Notwithstanding the large size and the whiteness of its cup, the more it expands, the more it disperses the fervent heat of the Sun ; and while, in the middle of Summer, at noon day, all other flowers, parched by his burning rays, droop and bend their heads to the ground, the lily rears his head like a king, and contemplates, face to face, the dazzling orb, which is travelling majestically through the Heavens.

I proceed to display, in a few words, the positive, or negative, relations of flowers, with respect to the Sun, to the five elementary forms which I have laid down, in the preceding Study,* as the principles of the harmony of bodies. This is not so much a plan which I take upon me to prescribe to Botanists as an invitation to engage in a career so rich in observations, and to correct my errors by communicating some portion of their knowledge.

There are, therefore, reverberating flowers *perpendicular, conical, spherical, elliptical, parabolic, or plane*. To these curves may be referred most of the curves of flowers. There are, likewise, some flowers in form of a parasol, but the others are much more numerous ; for the negative effects, in every harmony, are in much greater number than the positive effects. For example, there is but one single way of coming into life, and there are thousands of going out of it. We shall oppose, however, to every positive relation of flowers to the Sun, a principal negative relation, that we may be enabled to compare their effects in every Latitude.

PERPENDICULAR reverberating flowers are those which grow adhering by the back to a cone, to long catkins, or to an ear : Such are those of the cedar, of the larch, of the fir, of the birch, of the juniper ; of most of the northern gramineous plants, of the vegetables of cold

* See Second Vol. of Studies of Nature, Study X.

and lofty mountains, as the cypress and the pine ; or of those which flower in our climates about the end of Winter, as the hazel and the willow. A part of the flowers in this position is sheltered from the North wind, and receives the reflection of the Sun from the South side.

It is remarkable that all vegetables which bear cones, catkins, or spikes, present them at the extremity of their stems, exposed to all the action of the Sun. It is not so with those which grow within the Tropics ; most of which, such as the palm tree, bear divergent flowers, attached to pendent clusters, and shaded by their branches. The greatest part of the gramineous plants of warm countries, have likewise divergent ears ; such are the millets of Africa. The solid ear of the American maize is crowned with a hairy tuft which shelters its flowers from the Sun. On the annexed plate are represented an ear of European corn, and an ear of the rice of southern Asia, to furnish the means of comparison.

CONICAL reverberating flowers reflect on the parts of florification a complete cone of light. Its action is very powerful ; and it is, accordingly, very remarkable, that Nature has given this configuration of petal only to flowers which grow under the shade of trees, as to the convolvulus, which scrambles up around their trunk ; and that she has assigned to this flower a very transient duration, for it scarcely lasts half a day ; and when its fecundation is completed, the border contracts inwardly, and gathers together like a purse. Nature has, however, given it a place in southern latitudes, but she has there tinged it with violet and blue, in order to weaken the effect. Besides, this flower scarcely ever opens in hot countries, except in the night. From this nocturnal character, I presume, it is, that we are chiefly enabled to distinguish the convolvulus of the South, from that of our own climates, which blows in the day time. In the plate we have represented the day convolvulus, or that which is native with us, expanded ; and that of the night, or of hot

countries, closed; the one having a positive character with the light, and the other a negative character.

The flowers which partake the most of this conical form are those which grow early in the Spring, as the flower of the arum, which is formed like a cornet; or those which thrive on lofty mountains, as the bears ear of the Alps. When Nature employs it in Summer, it is almost always with negative characters, as in the flowers of the foxglove, which are inclined, and died a deep red, or blue colour.

SPHERICAL reverberating flowers, are those whose petals are formed into segments of a circle. One might amuse himself very agreeably, in observing that these spherically formed petals have, at their focufes, the antheræ of the flower supported on fibrets, longer or shorter, as the effect intended may require. It deserves farther to be remarked, that each petal is adapted to its particular anthera, sometimes to two, or even to three: So that the number of petals in a flower divides, almost always, exactly that of the antheræ. As to the petals, they scarcely ever exceed the number of five, in rose formed flowers, as if Nature had designed to express, in that, the number of the five terms of elementary progression, of which this beautiful form is the harmonic expression.

Spherical reverberating flowers are very common in our temperate climates. They do not throw back the whole reflection of their disks on the antheræ, like the convolvulus, but only the fifth part, because each of their petals has its particular focus. The rose formed flower is spread over most fruit trees, as the apple, the pear, the peach, the plum, the apricot, and the like; and over a great part of our shrubbery and herbage, such as the black and white thorn, the bramble, the anemone, and many others, most of which produce for Man a nutritious fruit, and which flower in the month of May. To this form may be likewise referred such as are spheroidal; the lily of the valley, for example.

This form, which is the harmonic expression of the five elementary forms, was admirably adapted to a temperature like ours, which is itself the proportional medium between that of the Icy and of the Torrid Zone. As spherical reflectors collect a great quantity of rays at their focufes, their action is very powerful, but, at the same time, of very transient duration. It is well known that nothing fades more quickly than a rose.

Rose formed flowers are very rare between the Tropics, especially those whose petals are white. They thrive only under the shade of trees. I have known many of the inhabitants of the Isle of France make fruitless efforts to raise strawberries there; but one of them, who lived, indeed, in an elevated part of the Island, found means of procuring them in great plenty, by planting his beds under trees, in ground but half cleared.

As a compensation for this, Nature has multiplied, in warm countries, papilionaceous, or leguminous flowers. The leguminous flower is entirely opposite to the rose formed. It usually has five rounded petals, like the other: But instead of being disposed round the centre of the flower, in order to reverberate thither the rays of the Sun, they are, on the contrary, folded inward, around the antheræ, for the purpose of sheltering them. You distinguish in them, a pavilion, two wings, and a ridge, usually divided into two, by which the antheræ and the embryo of the fruit are closely covered over. Between the Tropics, accordingly, a great number of trees, shrubs, creepers and grasses, have papilionaceous flowers. Every species of our pease and French beans, succeed there wonderfully well, and those countries produce infinite varieties of them. Nay, it is remarkable, that even at home, those plants delight in a sandy and warm soil, and exhibit their flowers in the middle of Summer. I consider leguminous flowers, therefore, as of the parasol kind. To those same negative effects of the Sun may, likewise, be referred the form of flowers with gullets, which conceal their antheræ, such

as the calf's snout, which takes pleasure in blowing on the sides of walls.

ELLIPTICAL reverberating flowers are those which present oval formed cups, narrower at top than in the middle. It is very perceptible that this form of cup, the perpendicular petals of which approach toward each other at the summit, shelters, in part, the bottom of the flower : And that the curves of these same petals, which have several focuses, do not collect the rays of the Sun toward one single centre : Such is the tulip. It is remarkable, that this oblong formed flower is more common in warm countries than the rose formed. The tulip grows spontaneously in the vicinity of Constantinople. To this form may likewise be referred that of the liliaceous, which are more common there than elsewhere. However, when Nature employs them in countries still farther to the South, or in the middle of Summer, it is almost always with negative characters ; thus, she has inverted the tulip form flowers of the imperial, which is originally from Persia, and has shaded them with a tuft of foliage. Thus, she bends back outwardly, in our climates, the petals of the lily ; but the species of white lilies which grow between the tropics, have, besides, their petals cut out into thongs.

Flowers with PARABOLIC, or PLANE, mirrors, are those which reflect the rays of the Sun in parallel directions. The configuration of the first gives much lustre to the corolla of these flowers, which emit from their bottom, if I may be allowed the expression, a bundle of light, for they collect it toward the bottom of their corolla, and not on the antheræ. It is, perhaps, in order to weaken the action of it, that Nature has terminated flowers of this form in a species of cowl, which Botanists call spur. It is probably in this tube that the focus of their parabola terminates, which is, perhaps, situated there, as in many curves of this kind, beyond its summit. Flowers of this sort are frequent between the Tropics ; such is the flower of the *poincillade* of the Antilles, otherwise called the

peacock flower, on account of its beauty ; such is also the *nasturtium*, or nun of Peru. It is even pretended that the perennial species is phosphoric in the night time.

Flowers with plane mirrors produce the same effects ; and Nature has multiplied the models of them in our Summer flowers, and in those which thrive in warm and sandy soils, as the radiated ; such are the flowers of the dandelion. We likewise meet with them in the flowers of the *doronicum*, of the lettuce, of the succory ; in the asters, in the meadow daisy and others. But she has placed the original model of them under the Line, in America, in the broad Sun flower, which we have borrowed from Brasil.

These being flowers whose petals have the least activity, are likewise those which are of the longest duration. Their attitudes are varied without end. Such as are horizontal, like those of the dandelion, close, it is said, toward the middle of the day ; they are, likewise, such as are the most exposed to the action of the Sun, for they receive his rays from his rising to his setting.

There are others which, instead of closing their petals, invert them, which produces nearly the same effect ; such is the flower of the camomile. Others are perpendicular to the Horizon, as the flower of Lettuce. The blue colour, with which it is tinged, contributes, farther, towards weakening the rays of the Sun, which, in this aspect, would act too vehemently upon it. Others have only four horizontal petals ; such as the cruci form ; the species of which are very common in hot countries. Others bear, around their disk, flowrets which overshadow it ; such is the blue bottle of the corn field, which is represented on the plate in opposition to the daisy. This last flowers early in the Spring, and the other in the middle of Summer.

We have said somewhat of the general forms of flowers, but we should never come to a conclusion, were we to enter into a discussion of their various aggregations. I

believe, however, that they may be referred to the plan itself of the flowers. Thus the umbelliferous flowers present themselves to the Sun under the same aspects as the radiated.

I must beg leave to recapitulate only what has been said respecting their reflecting mirrors. The reverberated perpendicular, of a cone or ear form, collects on the antheræ of the flowers, an arch of light of ninety degrees, from the Zenith to the Horizon. It farther presents, in the inequality of its panels, reflecting surfaces.

The conical reflector collects a cone of light of sixty degrees. The spherical reflector unites, in each of its five petals, an arch of light of thirty-six degrees of the Sun's course, supposing that Luminary to be in the Equator.

The elliptical reflector collects a smaller quantity, from the perpendicular position of its petals; and the parabolic reflector, as well as that with plane mirrors, sends back the rays of the Sun divergently, or in parallels.

The first form appears to be very common in the flowers of the icy Zones; the second, in those which thrive under the shade; the third, in temperate latitudes; the fourth, in warm countries; and the fifth, in the Torrid Zone. It would likewise appear, that Nature multiplies the divisions of their petals, in order to diminish their action. Cones and ears have no petals. The convolvulus has but one; rose formed flowers have five; elliptical flowers, as the tulip and the liliaceous, have six; flowers with plane reflectors, as the radiated, have a great number.

Farther, flowers have parts adapted to the other elements. Some are clothed externally with a hairy garment, to shelter them from the cold. Others are formed to blow on the surface of the water; such are the yellow roses of the nymphæa, which float on lakes, and accommodate themselves to the various movements of the waves, without being wet by them, by means of the long and pliant stems to which they are attached. Those of the *valis-*

neria are still more artfully disposed. They grow in the Rhone, and would be there exposed to frequent inundation by the sudden swellings of that river, had not Nature given them stems formed like a corkscrew, which draw out at once to the length of three or four feet.

There are other flowers adapted to the winds and to the rains, as those of pease, which are furnished with little boats to cover and shelter the stamina, and the embryos of their fruits.* Besides, they have large pavilions, and rest on tails bent and elastic, as a nerve; so that when the wind blows over a field of pease, you may see all the flowers turn their back to the wind, like so many weather cocks.

This class appears to be very generally diffused over places much exposed to the winds. *Dampier* relates, that he found the desert shores of New Guinea covered with pease, whose blossoms were red and blue. In our climates, the fern, which crowns the summits of hills always battered with the wind and rain, bears its flower turned toward the Earth, on the back of its leaves. There are even certain species of plants, the flowering of which is regulated by the irregularity of the winds. Such are those, the male and female individuals of which grow on separate stems. Tossed hither and thither over the earth, frequently at great distances from each other, the powder of the male flowers could fecundate but a very few female flowers, unless, at the season of their florification, the wind blew

* I am persuaded, that the bearing of most flowers is adapted to the rains, and for this reason it is that many of them have the form of mufflers, or ridges, like little boats inverted, which shelter the parts of fecundation. I have remarked that many species of flowers possess the instinct, shall I venture to call it? of closing themselves when the air is humid, and that the impregnation of fruit tree blossoms is injured much more by the rain than by the frost. This observation is of essential importance to gardeners, who frequently cause the flowers of their strawberry plants to miscarry by watering them. As far as I can judge, it would be better to water plants, in blossom, by little trenches, according to the Indian method, rather than by aspersions.

from various quarters. Wonderful to be told! there are invariable generations depending on the variableness of the wind. Hence I presume, that, in countries where the winds always blow from the same quarter, as between the Tropics, this species of florification must be uncommon; and if it be found there at all, it must be regulated precisely according to the season when those regular winds vary.

It is impossible to entertain a doubt respecting those admirable relations, however remote they may appear, when we observe the attention with which Nature has preserved flowers from the shocks to which they might be exposed, from the winds themselves, upon their stems. She inwraps them, for the most part, in an integument, which Botanists call the *calix*. The more ramous the plant is, the thicker is the calix of its flower. She sometimes fringes it with little cushions and beards, as may be seen in the rose bud. Thus the mother puts a pad round the head of her little child, to secure it against accidents from falling. Nature has so clearly marked her intention as to this, in the case of the flowers of ramous plants, that she has deprived of this clothing such as grow on stems that are not branchy, and where they are in no danger from the agitation of the winds. This may be remarked with regard to the flowers of Solomon's seal, of the lily of the valley, of the hyacinth, of the narcissus, of most of the liliaceous, and of plants which bear their flowers isolated, on perpendicular stems.

Flowers have, farther, very curious relations with animals and with Man, from the diversity of their configurations, and from their smells. Those of one species of the orchis represent bugs, and exhales the same unpleasant odour. Those of a species of the arum resembles putrid flesh, and has the infection of it to such a degree, that the flesh fly resorts thither to deposit her eggs. But those relations, hitherto very superficially investigated, do not come in so properly under this article; it is sufficient for

me to have here demonstrated, that they actually have very clearly marked relations with the elements, and especially with the Sun.

When Botanists shall have diffused over this branch of the subject all the light of which it is susceptible, by examining their focuses, the elevation to which they rise above the ground, the shelter, or the reflection of the bodies which are in their vicinity, the variety of their colours, in a word, all the means by which Nature compensates the differences of their several exposures, and they will no longer doubt about those elementary harmonies; they will acknowledge that the flower, far from presenting an unvarying character in plants, exhibits, on the contrary, a perpetual character of diversity. It is by this, principally, that Nature varies the species in the same genus of plant, in order to render it susceptible of fecundation, on different sites. This explains the reason why the flowers of the great chestnut of India, but originally from America, are not the same with those of the European chestnut; and that those of the fullers thistle, which thrives on the brink of rivers, are different from those of thistles, which grow in lofty and dry places.

A very extraordinary observation shall serve irrefragably to confirm all that we have just now advanced: It is this, that a plant sometimes totally changes the form of its flowers in the generation which reproduces it. This phenomenon greatly astonished the celebrated *Linnaeus*, the first time that it was submitted to his consideration. One of his pupils brought him, one day, a plant perfectly similar to the linarium, the flower excepted; the colour, the favour, the leaves, the stem, the root, the calix, the pericarpium, the seed, in a word, the smell, which is a remarkable circumstance, were exactly the same, only its flowers were in form of a tunnel, whereas those of the linarium are gullet formed. *Linnaeus* imagined, at first, that his pupil intended to put his knowledge to the test, by adapting a strange flower to the stem of that plant; but he

satisfied himself that it was a real *linarium*, the flower of which Nature had totally changed. It had been found among other *linaria*, in an island, seven miles distant from Upsal, near the shore of the sea, on a sandy and gravelly bottom. He himself put it to the proof, that it reperpetuated itself in this new state by its seeds. He afterwards found some of it in other places : And, what is still more extraordinary, there were, among these last, some which carried on the same stalk flowers tunnel formed, and flowers gullet formed.

He gave to this new vegetable the name of *pelorum*, from the Greek word *πῆλωρ*, which signifies prodigy. He afterwards observed the same variations in other species of plants, and among the rest, in the *eriocephalous* thistle, the seeds of which produce, every year, in the garden of Upsal, the fantastic thistle of the *Pyrennées*.* This illustrious Botanist accounts for these transformations, as being the effect of a mongrel generation, disturbed by the fecundating farina of some other flower in the vicinity. It may be so ; to his opinion, however, may be opposed, the flowers of the *pelorum*, and of the *linarium*, which he found united on the same individual. Had it been the fecundation which transformed this plant, it ought to have given similar flowers in the whole individual. Besides, he himself has observed, that there was not the slightest confusion in the other parts of the *pelorum*, any more than in its virtues ; but this must have been the case, as well as in the flower, had it been produced by a mixture of some strange breed. Finally, the *pelorum* reproduced itself by seed, which does not take place in any one mongrel species of animals.

This sterility, in mongrel branches, is an effect of the sage consistency of Nature, who cuts off divergent generations, in order to prevent the primordial species from being confounded, and from, at length, disappearing altogether.

* Upsalian Dissertation, for December, 1744 ; page 59, note 6.

er. As to the rest, I pry neither into the causes, nor the means, which she is pleased to conceal from me, because they far transcend my comprehension. I confine my enquiries to the ends which she kindly unfolds; I confirm myself in the belief, from the variety of flowers in the same species, and sometimes in the same individual, that they serve, in certain cases, as reflectors to vegetables, for the purpose of collecting, conformably to their position, the rays of the Sun on the parts of fecundation; and, in other cases, as parasols, to put them under covert from excessive heat.

Nature deals by them, nearly, as she does by animals which are exposed to the same variations of Latitude. In Africa, she strips the sheep of the woolly fleece, and gives her sleek smooth hair, like that of the horse: And to the North, on the contrary, she clothes the horse with the shaggy fur of the sheep. I have been an eye witness of this double metamorphosis, at the Cape of Good Hope and in Russia. I have seen at Petersburg, Norman and Neapolitan horses, whose hair, naturally short, was so long and so frizzled, in the middle of Winter, that you would have believed them covered with wool like sheep. It is not without reason, therefore, that the ancient proverb says: *GOD tempers the wind to the shorn lamb*: And when I behold his paternal hand varying the fur of animals conformably to the degree of heat and cold, I can easily believe, that it varies, in like manner, the mirrors of flowers conformably to the Sun. Flowers, then, may be divided, with relation to the Sun, into two classes: Into reverberating flowers, and flowers in form of a parasol.

If there be any constant character in plants, we must look for it in the fruit. It is thitherward that Nature has directed all the parts of vegetation, as to the principal object. That saying of Wisdom itself, *by their fruits ye shall know them*, is, at least, as applicable to plants as to the human species.

We shall examine, therefore, the general characters of plants, with relation to the places where their seeds are accustomed to grow. As the animal kingdom is divided into three great classes, quadrupeds, volatiles and aquatics, relatively to the three elements of the Globe; we shall, in like manner, divide the vegetable kingdom into aërial or mountain plants; into aquatics, or those of the shores; and into terrestrial, or those of the plains. But as this last participates of the two others, we shall not dwell upon it; for, though I am persuaded that every species, nay, that every variety, may be referred to some particular site of the earth, and may grow there in its highest degree of beauty, it is sufficient to say as much of it here as may be necessary to the prosperity of a small garden. When we shall have traced invariable characters, in the two extremities of the vegetable kingdom, it will be easy to refer to the intermediate classes, those which are adapted to them. We shall begin with the plants of the mountains.

Elementary Harmonies of Plants with the Water and the Air, by Means of their Leaves and their Fruits.

When the AUTHOR of Nature designed to clothe with vegetables even the highest and steepest pinnacles of the Earth, He first adapted the chains of mountains to the basons of the seas which were to supply them with vapours; to the course of the winds which were to waft them thither, and to the different aspects of the Sun by which they were to be heated. As soon as these harmonies were established between the elements, the clouds ascended out of the Ocean, and dispersed themselves over the most remote parts of the Continents. There they distilled, under a thousand different forms, in fogs, in mists, in dews, in rains, in snows. They descended from the heights of the

Atmosphere in every possible variety of manner ; some in a tranquil air, such as our Spring showers, came down in perpendicular drops, as if they had been strained through a sieve ; others, driven by the furious winds, beat horizontally on the sides of the mountains ; others fell in torrents, like those which, for nine months of the year, inundate the Island of Gorgona, placed in the heart of the Torrid Zone, in the burning Gulf of Panama. There were some which accumulated themselves, in mountains of snow, on the inaccessible summits of the Andes, to cool, by their effusions, the Continent of South America, and, by their icy Atmosphere, the vast expanse of the Pacific Ocean. In a word, mighty rivers flowed over regions where the rain never descends, and the Nile watered the plains of Egypt.

Then GOD said : " Let the Earth bring forth grass, " the herb yielding seed, and the fruit tree yielding fruit " after his kind, whose seed is in itself upon the Earth." At the voice of the Almighty, the vegetables appeared with organs perfectly fitted to collect the blessings of Heaven. The elm arose on the mountains which skirt the Tanaïs, clothed with leaves in form of a tongue ; the tufted box started from the brow of the Alps ; and the prickly caper tree from the rocks of Africa, with leaves hollowed into spoons. The pines on the sandy Norwegian hills attracted the vapours which were floating in the air, with their slim foliage, disposed like a Painter's pencil ; the verbasicum displayed its broad leaves on the parched sand, and the fern presented, on the hill, its fanlike foliage to the rainy and horizontal winds. A multitude of other plants, from the bosom of the rocks, from strata of flint, nay, even from marble incrustations, drunk in the waters of Heaven by cornets, by sandals and by cruets. From the cedar of Lebanon down to the violet which perfumes the grove, there was not one but what presented its large goblet, or its tiny cup, conformably to its necessity, or its station.

This adaptation of the leaves of plants, in elevated situations, for receiving the descending distillations of the rain, is varied without end ; but the character of it is discernible in most, not only in their concave forms, but likewise in a little canal, scooped out on the pedicle by which they are attached to their branches. It has something of a resemblance to that which Nature has traced on the upper lip of Man, to receive the humours which descend from the brain. It is particularly perceptible on the leaves of artichokes, which, being of the nature of thistles, agree with dry and sandy situations. These have, besides, collateral awnings to prevent the loss of any of the water that falls from Heaven. Plants which grow in places very hot, and very parched, sometimes have their stems or their leaves transformed entirely into a canal. Such are the aloes of the island of Zocotara, in the mouth of the Red Sea, or the prickly taper of the Torrid Zone. The aqueduct of the aloes is horizontal, and that of the taper perpendicular.

What has prevented Botanists from remarking the relations which the leaves of plants have with the waters that feed and refresh them, is their seeing them everywhere nearly of the same form, in the valleys, as on the heights ; but though mountain plants present foliages of every kind of configuration, you may easily discern, from their aggregation in form of pencils, or fans, from the gatherings of the leaves, or other equivalent signs, that they are destined to receive the rain water, but chiefly from the aqueduct which I have just mentioned. This aqueduct is traced on the pedicle of the smallest leaves of mountain plants ; by means of it, Nature has rendered the forms themselves of aquatic plants susceptible of vegetation in the most parched situations.

The bulrush, for example, which is only a round and full straw, that grows by the water side, did not appear susceptible of collecting any humidity in the air, though it is very well suited to lofty situations, from its capilla-

aceous form, which, like that of gramineous plants presents nothing to the wind to lay hold of. In fact, if you consider the different species of rush which clothe the mountains in many parts of the world, such as that called *icho*, on the lofty mountains of Peru, the only vegetable almost that grows there, and those which thrive with ourselves in dry sands, or on heights, you would, at the first glance, believe them similar to the rush of marshy places; but with a little attention, and not without astonishment, you will observe that they are hollowed into a furrow the whole of their lengthwise direction. They are, like other rushes, convex on one side, but they differ from them essentially, in that they are all concave on the other; I was enabled to distinguish, by this same character, the *sparta*, which is a rush of the mountains of Spain, and is now frequently manufactured at Paris into cordage for their draw wells.

Many leaves, even of the plants of the plains, assume, on their first springing up, this form of little furrow, or spoon, as those of the violet, and of most gramineous plants. You may perceive, in the Spring, the young tufts of these raising themselves upright toward Heaven, like paws, to catch the falling drops, especially when it begins to rain; but most plants of the plains lose their gutter as they expand. It has been bestowed on them only during the season when it was necessary to their growth. It is permanent only in the plants of the mountains. It is traced, as has been mentioned, on the pedicle of the leaves, and conducts the rain water into the tree, from the leaf to the branch: The branch, by the obliquity of its position, conveys it to the trunk, from whence it descends to the root, by a series of successive dispositions. If you pour water gently over the leaves of a mountain shrub, which are the farthest from its stem, you will perceive it pursue the progress which I have just indicated, and not a single drop will be lost on the ground.

I have had the curiosity to measure, in some mountain plants, the inclination which their branches form with their stem; and I have found, in at least a dozen of different species, as in the fern, the thuia, and the like, an angle of about thirty degrees. It is very remarkable, that this degree of incidence is the same with that which is formed, in a flat country, by the course of many rivulets and smaller rivers, with the great rivers into which they discharge themselves, as may be ascertained by reference to maps. This degree of incidence appears to be the most favourable to the efflux of many fluids, which direct themselves toward one single line. The same Wisdom has regulated the level of the branches in trees, and the course of the stream through the plains.

This inclination undergoes some varieties in certain mountain trees. The cedar of Lebanon, for example, sends forth the lower parts of its branches, in an upward direction, toward Heaven, and lowers their extremities, by bending them downward to the Earth. They have the attitude of command which is suited to the king of vegetables, that of an arm raised up into the air, with the hand gently inclining. By means of the first disposition, the rain water is conveyed along the sloping branch to the trunk; and by the second, the snows, in the regions of which it takes delight to dwell, slide away from off its foliage. Its cones have, in like manner, two different attitudes; for it inclines them, at first, toward the Earth, to shelter them at the season of their flowering; but when they are fecundated, it erects them toward Heaven. The truth of these observations may be confirmed by referring to a young and beautiful cedar in the Royal Garden, which, though a stranger, has preserved, in the midst of our climate, the air of a King, and the majestic port of Lebanon.

The bark of most mountain trees is equally adapted for conducting the rain water from the branches to the roots. That of the pine is in large perpendicular ribs; that of

the elm is cleft and chinked longitudinally ; that of the cypress is spongy, like the coat of flax.

The plants of mountains, and of dry grounds, have a farther character, which is, in general, peculiar to them : It is that of attracting the water which floats in the air, in imperceptible vapours. The parietaria (pellitory) which has derived its name from the Latin word *pariete*, (wall) because it grows on the sides of walls, has its leaves almost always in a humid state. This attraction is common to most trees of the mountains. Travellers unanimously assure us, that there is, in the mountains of the Island of Ferro, a tree, which furnishes every day, to that island, a prodigious quantity of water. The islanders call it *garoé*, and the Spaniards *santo*, from its singular utility. They tell us it is always surrounded with a cloud, which distils copiously along its leaves, and fills with water the large reservoirs which are constructed at the root of this tree, affording an abundant supply for the island.

This effect is, perhaps, somewhat exaggerated, though related, in nearly the same terms, by persons of different Nations : But I give full credit to the general fact. The real case I take to be this, it is the mountain which attracts from afar the vapours of the Atmosphere, and that the tree, situated in the focus of attraction, collects them around it.

Having frequently spoken, in the course of this Work, of the attraction of the summits of many mountains, the Reader, perhaps, will not be displeased, if I present to him, in this place, an idea of that branch of the hydraulic architecture of Nature. Among a great number of curious examples, which I might produce to this purpose, and which I have collected, as an addition to my materials on the subject of Geography, I beg leave to present one, which I have extracted, not from a systematic Philosopher, but from a simple and unaffectedly sprightly traveller of the last age, who relates things as he saw them, and without pretending to deduce consequences of any kind what-

ever. It is a description of the summits of the Island of Bourbon, situated in the Indian Ocean, extending to the twentyfirst degree of South Latitude. It is copied from the writings of M. *de Villers*, who was then Governor of that island, under the Eastindia Company. It is published in the journals of the first voyages made by our French Navigators into *Arabia Felix*, about the year 1709, and given to the World by M. *de la Roque*. See that Work, page 201.

“ Of those plains,” says M. *de Villers*, which are upon the mountains (of Bourbon) “ the most remarkable, “ though no account has hitherto been given of it, is that “ to which they have given the name of the Plain of the “ Cafres, from a tribe of that People, slaves to the inhabitants of the Island, who went thither to conceal themselves, after they had ran away from their masters. “ From the shore of the sea, you rise by a gentle ascent, “ for seven leagues together, in order to reach this plain, “ by the single path that leads to it, along the river of “ Saint Stephen : It is possible, however, to ride up on “ horseback. The soil is good and smooth to about a “ league and a half, on this side the plain, planted with “ large and beautiful trees, the foliage of which, as it falls, “ serves for food to the tortoises, which are to be found “ there in great numbers.

“ The height of this plain may be estimated at two “ leagues above the Horizon ; it accordingly appears “ from below to be quite lost in the clouds. Its circumference may be about four or five leagues. The cold “ is there insupportable, and a continual fog, which wets “ as much as rain, prevents your seeing objects ten paces “ distant ; as it falls in the night, you may see through it “ more clearly than by day : But then it freezes dreadfully, and in the morning, before sun rise, the plain is “ frozen all over.

“ But what strikes the eye of the beholder as very extraordinary, are certain elevations of ground, cut out

“ almost in form of round columns, and of a prodigious
“ height ; for they cannot be much lower than the tur-
“ rets of Notre Dame at Paris. They are put down like
“ pins on the skittle ground, and the resemblance is so
“ strong, that you may easily mistake on reckoning them :
“ They go by the name of *pitons* (pins). If you wish to
“ stop by one of those eminences to take rest, such of
“ your company as are not inclined to repose, but want
“ to go forward, must not withdraw so much as two hun-
“ dred paces, otherwise they will be in great danger of
“ not finding again the point of separation, these pins are
“ so many in number, all similar in form, and so much
“ arranged in the same manner, that the Creoles, who are
“ native there, are themselves liable to mistake.

“ For this reason it is, that, in order to prevent the un-
“ pleasant consequences of such an error, when a compa-
“ ny of travellers take station at one of the pins, if any
“ are disposed to make a farther excursion, they leave a
“ person at the place of rendezvous, to make a fire, or
“ raise a smoke, which may serve to direct, and bring
“ back the strayers ; and if the *fog* be *so thick*, which is
“ frequently the case, as to hinder the fire or the smoke
“ from being seen, they provide themselves with a kind
“ of large shells, one of which is left with him who keeps
“ station at the pin ; another is carried off by the separat-
“ ing party ; and when they wish to return, some one
“ blows violently into the shell, as into a trumpet, which
“ emits a very shrill sound, and capable of being heard at
“ a great distance ; this is answered by the other, and be-
“ ing repeated as often as is necessary, they are easily re-
“ covered from straying, and collected at the point of de-
“ parture. Without such precautions, the traveller might
“ be bewildered.

“ In this plain are many aspin trees, and they are al-
“ ways green. Other trees are covered with a moss of
“ more than a fathom in length around their trunk and
“ large branches. They are withered, without foliage,

“ and so impregnated with moisture, that it is impossible
 “ to make them take fire. If, with much difficulty; you
 “ are able to kindle some of the smaller boughs, it is on-
 “ ly a dark fire without flame, which emits a reddish
 “ smoke, that defiles the meat instead of roasting it. You
 “ can hardly find a spot in this plain on which to kindle
 “ a fire, unless by looking about for some small elevation
 “ round the peaks; for the soil of the plain is so humid,
 “ that the water every where spouts out, so that you are
 “ continually in mud, and moistened up to the calf of the
 “ leg. Great numbers of blue birds are to be seen there
 “ nestling in the herbage, and among the aquatic ferns.
 “ This plain was unknown before the desertion of the
 “ Cafres. In order to get down, you must return by the
 “ same way that you ascended, unless you choose to run
 “ the risk of another path, which is very rough, and dan-
 “ gerously steep.

“ From the plain of the Cafres may be seen the moun-
 “ tain known by the name of *Trois Salases*, from the
 “ three points of that rock, the loftiest in the Island of
 “ Bourbon. All its rivers issue from thence, and it is so
 “ steep on every side, that there is no possibility of climb-
 “ ing it.

“ There is, besides, in this island, another plain, called
 “ the Plain of Silaos, higher than that of the Cafres, and
 “ of no greater value: It is extremely difficult to get up
 “ to it.”

In the lively description of our Traveller, we must o-
 verlook some errors in Physics, such as his assigning to
 the Plain of the Cafres an elevation of two leagues above
 the Horizon. He had not learned from the barometer
 and thermometer, that there is no such elevation on the
 face of the Globe, and that, at the perpendicular height of
 one league only, the freezing point is invariable. But
 from the thick fog which surrounds those peaks, from that
 continual mist which wets as much as rain, and which falls
 during the night, it is evidently perceptible, that they at-

tract to them the vapours, which the Sun raises out of the Sea in the day time, and which disappear in the night. Hence is formed that sheet of water which inundates the Plain of the Cafres, and from which most of the brooks and rivulets that water the island take their rise. You may equally distinguish a vegetable attraction in those evergreen aspens, and those other trees, at all times humid; which it is impossible to kindle into flame.

The Island of Bourbon is almost round, and rises out of the Sea in the shape of half an Orange. On the highest part of this hemisphere are situated the Plains of Silaos and of the Cafres, where Nature has placed those labyrinths of peaks continually involved in fogs, planted like nine pins, and elevated like so many turrets.

Did time and room permit, I could make it evident, that there are a multitude of similar peaks on the chains of lofty mountains, of the Cordeliers, of Taurus and others, and at the centre of most islands, without admitting the possibility of supposing, though the opinion be current, that they are the remains of a primitive Earth raised to that height; for, What must have become, as has been already demanded, of the wreck of that Earth, the pretended testimonies of which arise on every hand over the surface of the Globe? I could demonstrate that they are placed in aggregations, and in situations adapted to the necessities of the countries of which they are, in some sense, the reservoirs; some in a labyrinth, as those of the Island of Bourbon, when they are on the summit of a hemisphere, from whence they are destined to distribute the waters of Heaven in every direction; others in form of a comb, when they are placed on the extended crest of a chain of mountains, as the pointed peaks of the chain of Taurus and of the Cordeliers; others grouped into pairs, into threes, according to the configuration of the territory which they are to water. They are of many forms, and of different constructions: Some of them are incrustations of earth, as those of the Plain of the Cafres, and of some of the An-

tilles Islands, and which are besides so steep, as to be entirely inaccessible. Those incrustations of earth demonstrate, that they have, at once, fossil and hydraulic attractions.

There are others which present long needles of solid and naked rock; others are of a conical form; others are flattened as a table, such as that of Table mountain, at the Cape of Good Hope, where you may frequently see the clouds accumulate, and spread like a table cloth. Some are not apparent, but entirely involved in the side of mountains, or in the bosom of plains. They are all distinguishable by the fogs which they attract around them, and by the sources which emit their streams in the vicinity. Nay, you may rest assured, that there is no source but in the neighbourhood of some quarry of hydro attractive, and, for the most part, of metallic stone. I ascribe the attraction of those peaks to the vitreous and metallic bodies of which they are composed: And I am persuaded it might be possible to imitate this architecture of Nature, and to form, by means of the attraction of such stones, fountains of water in the most parched situations. In general, vitreous bodies, and stones susceptible of polish, are very proper for this purpose; for it is observable, that when water is diffused in great quantities through the air, as at the time of a general thaw, it is first attracted, and attaches itself, to the glass windows and the polished stones of our houses.

I have frequently seen on the summit of the mountains, in the Isle of France, effects similar to those of the peaks of the Plain of the Cafres, in the Island of Bourbon. The clouds collect there incessantly around their peaks, which are steep and pointed, like pyramids. Some of those peaks terminate in a rock of a cubical form, which crowns them like a chapter. Such is that one which they call *Piterbooth*, after the name of a Dutch Admiral; it is one of the loftiest in the Island.

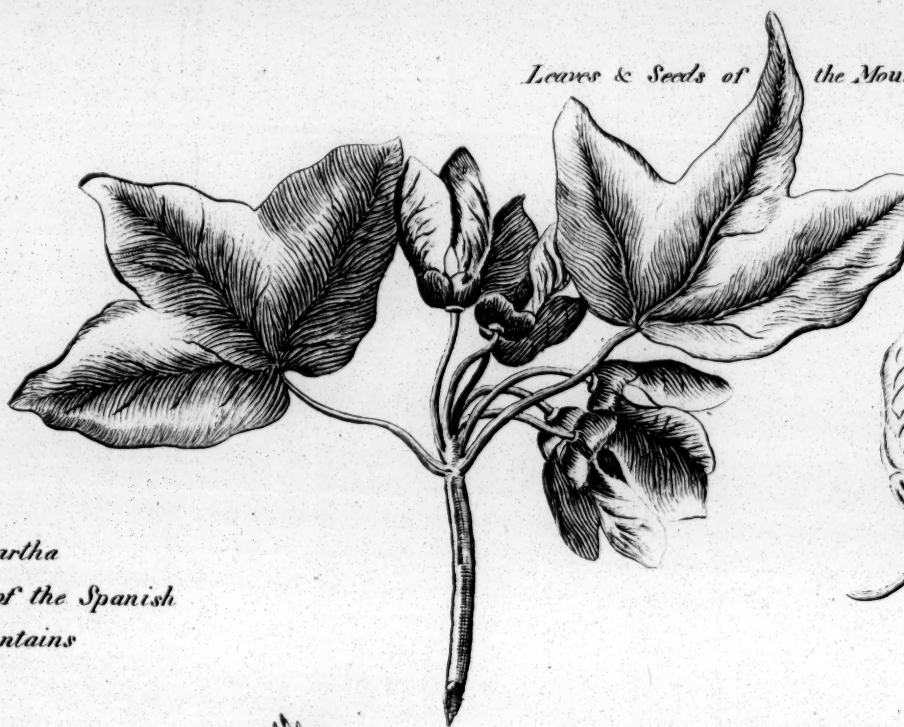
Those peaks are formed of solid rock, vitrifiable, and mixed with copper : They are real electrical needles, both in form and substance. The clouds perceptibly deviate from their course to collect upon them, and there accumulate, sometimes to such a degree, that the pinnacles become totally invisible. They thence descend into the cavity of the valleys, along the declivities of the forests, which likewise attract them, and there dissolve into rain, frequently forming rainbows on the verdure of the trees. This vegetable attraction, of the forests of that island, is in such perfect harmony with the metallic attraction of the peaks of its mountains, that a field situated in an open place, in their vicinity, very often suffers for want of rain, whereas it rains almost the whole year round in the woods, which are not above a gunshot distant. It was by the destruction of part of the trees that clothed the heights of the island, that most of the brooks which watered it have been dried up : And now nothing remains of them but the empty channel.

To the same injudicious management, I ascribe the sensible diminution of a considerable part of the rivers of Europe, both great and small ; as is evident from a simple inspection of their ancient bed, which is much broader and deeper than the mass of water at this day transmitted by them to the Ocean. Nay, I am persuaded, that to this cause we must ascribe the dryness of the more elevated provinces of Asia, those of Persia, in particular, the mountains of which have, no doubt, been injudiciously stripped of their trees, by the first tribes who inhabited them. I am decidedly of opinion, that were we to plant in France mountain loving trees, on the high grounds, and at the sources of our rivers, their ancient volume of water might be restored, and many rivulets might be made to reassume their current through our plains, though they have long since ceased to flow. It is neither among the reeds, nor in the depth of the valley, that the Naiads conceal their exhaustless urns, as Painters represent them, but at the



LEAVES WITH AN AQUEDUCT AND VOLATILE

Leaves & Seeds of the Mountain



Spartha
or rush of the Spanish
Mountains



Stump of the
Spartha with
its Gutter



Leaf & Cone
of the Cedar
of Lebanon



Kernel of the Cedar
attached to its Wood

FLATILE FRUITS OF MOUNTAIN VEGETABLES

the Mountain Maple

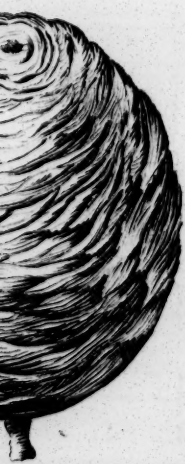


Rush of the Marshes

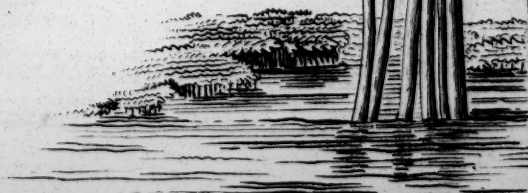


Leaf & Seeds
of the
Dandelion

Full Stump
of the Rush of
the Marshes



of the Cedar
to its Wing



summit of rocks crowned with wood, and towering to the Heavens.

There is not a single vegetable, the leaf of which is disposed to receive the rain water on the mountains, whose seed is not formed in a manner the best adapted to raise itself thither. The seeds of all mountain plants are volatile. By inspecting their leaves, it is possible to ascertain the character of their grains, and by inspecting the grains, that of their leaves, and thence to infer the elementary character of the plant. By mountain plants, I here wish to be understood to mean all those which grow in sandy and parched situations, on hillocks, in rocks, on steep ridges by the highway's side, in walls, and, in one word, at a distance from water.

The seeds of thistles, of blue bottles, of dandelion, of succory, and many others, are furnished with pinions, with plumes, with tufts, and various other means of rising, which convey them to prodigious distances. Those of the grasses, which likewise travel very far, are provided with a light chaffy coat, and with bearded husks. Others, such as those of the yellow gilliflower, are cut into thin scales, and fly by the slightest breath of the wind, and plant themselves in the most inconsiderable crevice of a wall. The seeds of the largest mountain trees are no less volatile. That of the maple has two membranous pinions, similar to the wings of a fly. That of the elm is cased in the midst of an oval thin leaf. Those of the cypress are almost imperceptible. Those of the cedar are terminated by broad and thin plates, which, in their aggregated state, compose a cone. The grains are in the centre of the cone; and when arrived at maturity, the thin membranes, to which they adhere, separate from each other, like the cards in a pack, and each of them flies off with its own little kernel. (*See the annexed Plate.*)

The seeds of mountain plants, which appear too heavy for flying, are furnished with other resources. The pease of the balsamine have pods whose elasticity darts them to a

considerable distance. There is likewise a tree in India, the name of which I do not now recollect, that, in like manner, discharges its seeds with a noise like that of a musket fired off. Those which have neither tufts, nor pinions, nor springs, and which, from their weight, seem condemned to remain at the foot of the vegetable which produced them, are, in very many cases, those which travel the farthest. They fly off with the wings of a bird. It is thus that a multitude of berries and shell fruits resow themselves. Their seeds are inclosed in stony incrustations, not capable of being digested. They are swallowed by the birds, which carry them off, and plant them in the cornices of towers, in the clefts of rocks, on the trunks of trees, beyond rivers, nay, beyond oceans. By such means it was that a bird of the Moluccas repeopled, with the nutmeg plant, the desert islands of that archipelago, in defiance of all the efforts of the Dutch, who destroy those trees in every place where they cannot be subservient to their own commerce.

This is not the place for bringing forward the relations which vegetables have to animals. It is sufficient to observe, as we go along, that most birds resow the vegetable which feeds them. Nay, we find, without going from home, quadrupeds which convey to a great distance the seeds of the grasses. Such, among others, as do not chew the cud, horses for instance, whose dung is hurtful to the meadows, for an obvious reason, they introduce into them a variety of foreign herbs, as the heath and the short furze, the seeds of which they are unable to digest. They resow, besides, a great many others, which adhere to their hair, by the motion of their tail simply. There are quadrupeds of small size, such as the dormouse, the hedgehog and the marmot, which convey to the most elevated regions of the mountains, acorns, beechmast and chesnuts.

It is singularly worthy of remark, that volatile seeds are produced in much greater number than those of other species; and in this, we are called upon to admire the intel-

ligence of that Providence which foresaw every thing, and arranged all accordingly. The elevated situations for which they are destined, were exposed to be speedily stripped of their vegetables, by the declivity of their soil, and by the rains, which have a continual tendency to lower them. By means of the volatility of grains, they are become, of all the places of the Earth, the most prolific in plants. In the mountains is deposited the Botanist's treasure.

It cannot be too frequently repeated, The remedies provided by Nature always surmount the obstacles which she has opposed; and her compensations ever exceed her gifts. In truth, if you except the inconveniencies of declivity, a mountain presents to plants the greatest variety of exposures. In a plain they have the same Sun, the same degree of humidity, the same soil, the same wind; but if you ascend a mountain, situated in our Latitude, only twentyfive fathoms of perpendicular height, you change your climate as much as if you had travelled twentyfive leagues northward; so that a mountain of twelve hundred fathoms perpendicular height, would present us with a scale of vegetation as extensive as that of twelve hundred leagues along the Horizon, which is nearly our distance from the Pole: Both the one and the other would terminate in a region of perpetual ice. Every step we take upon a mountain, whether ascending or descending, gives us a change of Latitude; and if we encompass it round and round, every step changes our Longitude. We shall fall in with points where the Sun rises at eight o'clock in the morning; others, at ten o'clock; others, at noon. We should find an infinite variety of exposures; of cold toward the North, of heat to the South, of rain to the West, of drought to the East; without taking into the account the different reflections of heat in sands, rocks, bottoms of valleys and lakes, which modify them a thousand various ways.

We must proceed farther to observe; and who can do it without profound admiration? that the season of the maturity of most volatile seeds takes place toward the commencement of Autumn; and that, from an effect of the universal Intelligence, which constrains all the parts of Nature to act in concert, then it is that we have the most violent gales of wind, about the end of September or beginning of October, called the equinoctial winds. These winds blow in all parts of the Continents, from the bosom of the seas to the mountains which are in correspondence with them. Not only do they convey thither the volatile grains which have then attained to a state of maturity; but likewise blend with these thick clouds of dust, which they carry off from lands dried up by the burning heats of Summer, and particularly from the shores of the Sea, where the incessant motion of the billows, which there break, and continually toss the pebbly strand backward and forward, reduce the hardest bodies to an impalpable powder.

Those emanations of dust are in many places so copious, that I could produce a variety of instances of vessels covered with them, as they were crossing gulfs, though more than six leagues distant from land. They are so troublesome in the loftier provinces of Asia, that all travellers who have visited Pekin assure us, it is impossible to walk the streets of that city, for a considerable part of the year, without having the face veiled. Thus there are rains of dust which repair the summits of the mountains, as there are rains of water which feed their sources. Both the one and the other issue from the Sea, and return to it by the course of the rivers, which are perpetually conveying thither, their constant tribute of waters and sands. The maritime winds unite their efforts toward the autumnal equinox, transport from the circumference of the Continents, to mountains the most remote from them, the seeds and the manure which had flowed from thence, and sow meadows, groves and forests, on the sides of precipi-

ces, and the most inaccessible peaks. Thus the leaves, the stems, the seeds, the birds, the seasons, the seas and the winds, concur, in a most wonderful manner, to keep up the vegetation of the mountains.

I have been mentioning the relations of plants to mountains; I am mortified that it is not in my power here to insert the relations which mountains themselves have with plants, according to my original intention. All that I can, at present, say on the subject is, that so far are mountains from being the productions of a centrifugal force, or of fire, or of earthquakes, or of water courses, I know of, at least, ten different species, each of which has a configuration the most perfectly adapted for keeping up, in every particular Latitude, the harmony of the elements relatively to vegetation. Each of them has, moreover, vegetables and quadrupeds peculiar to itself, and which are not elsewhere to be found: This proves to a demonstration, that they are not the work of chance. Finally, among that inconceivable number of mountains which cover the greatest part of the five Zones, and especially the Torrid and the Icy Zones, there is but one single species, the least considerable of all, which presents to the water courses projecting and retreating angles in correspondence. This, however, is no more their work than the basin of the seas is itself the work of the Ocean. But this interesting subject, of an extent too considerable to admit of its being here introduced, belongs, besides, to the province of Geography.

Let us now proceed to display the harmonies of aquatic plants.

These have dispositions entirely different in their leaves, the bearing of their branches, and, above all, in the configuration of their seeds. Nature, as has already been observed, in order to vary her harmonies, only employs, in very many cases, positive and negative characters. She has bestowed an aqueduct on the pedicle of the leaves of mountain plants; she withdraws it from those which grow

by the side of the waters, and transforms them into aquatic plants. These, instead of having their leaves hollowed out into gutters, are clothed with leaves smooth and sleek, such as the cornflag, which bears them in form of a poignard's blade, or swelling in the middle like a sword blade, as those of the species of reed called typha, that common sort, the stem of which the Jews put into the hand of JESUS CHRIST. Those of the nymphæa are plane, and rounded in form of a heart. Some of these species affect other forms, but their long tails are uniformly destitute of a canal. Those of the bulrush are round like a pipe. There is an endless variety of rushes on the brink of morasses, rivulets and fountains. You will find them of all sizes, from those which have the fineness of a hair, up to the species which grows in the river of Genoa, as large as a cane. Whatever difference there may be in the jointing of their stalks and of their pannicles, they all have, in their plan, a round or elliptical form. You will find those species alone which grow in parched situations, to be fluted and hollowed on their surface. When Nature intends to render aquatic plants susceptible of vegetation on the mountains, she bestows aqueducts on their leaves; but when, on the contrary, she means to place mountain plants by the water's side, she withdraws it. The aloës of the rock has its leaves hollowed into a scoop; the aloës of the water has them full. I am acquainted with a dozen species of mountain fern, every one of which has a small fluting along its branches, and the only species of the marshes, which I know, wants it. The bearing of its branches is likewise very different from that of the others. The first rears them toward Heaven, the last bears them almost horizontally.

If the leaves of mountain plants are constructed in the best manner possible for collecting, at their roots, the waters of Heaven, which they have not always at command; those of aquatic plants are frequently disposed in such a manner, as to remove them, because they are destined to

grow in the bosom of water, or in its vicinity. The leaves of trees which love the water's side, as the birch, the aspen and the poplar, are attached to long and pendent tails. There are others which bear their leaves disposed in form of tiles, as the great chefnut of India and the walnut. Those of plants which grow in the shade, around the trunk of trees, and which derive, by their roots, the humidity collected by the foliage of the tree, as the French bean and the convolvulus, have a similar bearing. But those which grow entirely under the shade of trees, and which have scarcely any roots, as mushrooms, have leaves, that, so far from pointing toward Heaven, are turned downward to the earth. The greatest part are formed on the upper side into a thick parasol, to prevent the Sun from drinking up the moisture of the soil in which they grow; and they are divided, on the under side, into thin leafy plates, for receiving the vapours which exhale from the ground, nearly as those of the horizontal wheel of a fire engine receives the steam of the boiling water which makes it to turn about. They have, besides, several other means of watering themselves by these exhalations. There are many numerous species, lined with tubes, others are stuffed with sponges. There are some whose pedicle is hollow inwardly, and which, bearing a chapter atop, there collect the emanations of their soil, as in an alembic. Thus, there is not a particle of vapour in the Universe that goes to waste.

What has just now been said of the inverted forms of mushrooms, of their leafy plates, of the tubes and sponges with which they are lined, for receiving the vapours exhaled from the ground, confirms what was advanced respecting the use of the leaves of mountain plants, hollowed into gutters, or constructed into the form of a pencil, or of a fan, for receiving the waters of Heaven. But aquatic plants, which had no need of such recipients, because they thrive in water, have, if I may so express myself, a repulsive foliage. I shall here present an object of

comparifon, calculated to produce conviction of the truth of thofe principles : For example, the mountain box tree, and the caper plant of the rocks, have their leaves hollowed into a fpoon form, with the concavity turned toward Heaven ; but the vaccinium of the marfhes, (cranberry) or *vaccinia paluftris*, which is likewise furnifhed with concave leaves, bears them inverted, with the cavity turned toward the earth. From this negative character, I was enabled to diftinguifh, as a plant of the marfhes, a very rare plant in the Royal Garden, which I faw for the firft time. It is the *latum paluftre*, which grows in the marfhes of the Labrador country. Its leaves, formed like little coffee fpoons, are all inverted ; their convex fide being turned toward Heaven. The water lentil of our marfhes, as well as the typha of our rivers, has the middle of its leaf fwelled.

Botaniffts, on obferving leaves nearly fimilar in plants, on the brink of the water, and on the heights of mountains, never entertained a fufpicion, that they could anfwer purpofes fo different. Many of them, no doubt, are perfons of profound erudition ; but their learning is rendered entirely ufelefs to them, becaufe their method confines them to proceed in one fingle track, and their fystem indicates to them only one kind of obfervations. This is the reafon that their moft numerous collections, frequently, prefent nothing but a mere vocabulary. The ftudy of Nature is fpirit and intelligence fimplly. Her vegetable order is an immense volume of which plants form the thoughts, and the leaves of thofe very plants, the letters. Nay, there is not a very great number of primitive forms in the characters of this alphabet : But by means of their various afemblages, fhe forms, as we do with ours, an infinite number of different thoughts. As it is with language, in order totally to alter the meaning of an expreffion, all that fhe has in many cafes, to do, is to change an accent. She places rufhes, reeds, arums with a fleep foliage and a full pedicle, on the banks of rivers :

She traces an aqueduct in the leaf, and transforms them into rushes, reeds and arums of the mountains.

We must, at the same time, be carefully on our guard against generalizing these means; otherwise they will quickly betray us into a misapprehension of her procedure. For example, certain Botanists, having suspected that the leaves of some plants might very well be adapted for collecting the rain water, believed that they had a perception of this use in that of the *dipsacus*, or fullers' thistle. It was very easy to fall into a mistake here, for the leaves are opposite, and meet at their bases; so that after it has rained, they present reservoirs, which contain, one with another, a good half glass of water, and which are disposed in stories along its stem. But they ought to have considered, first, that the *dipsacus* grows naturally on the brink of waters, and that Nature does not bestow cisterns of water on aquatic plants. This would be, according to the proverb, to carry water to the river. Secondly, they might have observed, that the tiers formed by the opposite leaves of the *dipsacus*, so far from being reservoirs, are, on the contrary, dischargers, which convey off the rain water from its roots, to the distance of nine or ten inches, on every side, by the extremities of its leaves. They resemble, in some respects, the gutters which project from the roofs of our houses, or those which are formed by the corners of our hats, which serve to carry away the rain water from the body, and not to throw it inward. Besides, the water which remains in the cavity of the leaves of the *dipsacus* never can get down to the root of the plant, for it is detained there, as at the bottom of a vase. It would not even be proper for moistening it, for *Pliny* insists that it is brackish. The birch wort, which grows in the trembling and frothy marshes of Canada, carries, at its base, two leaves, formed like the halves of a trumpet sawed asunder lengthwise. They are both concave, but have, at the extremity that is farthest from the plant, a kind of bill, shaped like a spout. The water which re-

mains in the receivers of these aquatic plants, is, perhaps, destined to supply drink to the small birds, which sometimes find themselves not a little embarrassed how to come at it, in the time of inundations.

It is necessary carefully to make a distinction between the elementary, and the relative, characters of plants. Nature obliges the man who studies her, not to hold to external appearances, and, in order to form his understanding, she makes him rise from the means which she employs, to the ends which she proposes. If certain aquatic plants seem to present, in their foliage, some of the characters of mountaineers, there are upon the mountains, some which seem to present characters similar to those of the waters; such, for example, is the broom. It bears leaves so small, and so few in number, that they appear insufficient for collecting the water necessary to its growth, and so much the more, that it thrives in soils the most parched. Nature has indemnified it in another manner. If its leaves are small, its roots are very long. They go in quest of coolness to a great distance. I have seen some of them extracted from the earth, which were more than twenty feet in length, and it was necessary, after all, to break them off, it being impossible to reach the extremities. This prevents not the scanty leaves from exhibiting the mountain character; for they are concave, they point toward Heaven, and are lengthened out, like the under bill of a bird.

The greatest part of aquatic vegetables throw the water off from them, some by their port; such as the birch, the branches of which, so far from rearing themselves toward Heaven, fall downward, in form of an arch. The same thing may be affirmed of the great chestnut and of the walnut, unless these trees should have changed their natural attitude, by growing in thirsty situations. Their bark is usually sleek, as that of the birch, or scaly, like that of the chestnut; but not hollowed into canals, as that of the elm, or the mountain pine. Others have in themselves a

repulsive quality: Such are the leaves of the nymphæa, and of several species of colewort, on which the drops of water collect into globules, like the particles of quicksilver. Nay, there are some which it is extremely difficult to moisten, such as the stems of many species of capillary plants. The laurel, we are told, carries its repulsive quality to such a degree, as to repel the thunder. If this quality, so highly extolled by the Ancients, is really possessed by the laurel, we must, undoubtedly, ascribe this to its nature as a fluviatic plant. The laurel grows in abundance on the banks of the rivers of Theffaly. A traveller, whose name is the *Sieur de la Guilletière*,* says, in a relation written in a very lively and agreeable manner, that he never saw any where such fine laurels as along the side of the river Peneus. Hence, perhaps, was suggested the idea of the metamorphosis of *Daphne*, the daughter of that river deity, transformed by *Apollo* into a laurel.

This repulsive property of certain trees, and of some aquatic plants, induces me to think that they might be employed around our habitations, as a security against thunder storms, and that in a manner more certain, and much more agreeable, than electrical conductors, which dissipate, only by attracting them to the neighbourhood. They might farther be very advantageously employed for drying marshy grounds; as the attractive qualities of many mountain vegetables, might be used in forming fountains upon heights, by collecting there the vapours which float in the air. There is not, perhaps, an infectious morass on the Globe, except in places where men have injudiciously destroyed the plants whose roots absorbed the humidity of the Earth, and whose foliage repelled that of the Heavens.

I pretend not to affirm, however, that the foliage of aquatic plants has no farther uses: For where is the man who has entered into the endless views of Nature? "To

* See the Voyage to Lacedemon, by the *Sieur de la Guilletière*.

“ whom hath the root of wisdom been revealed ? or, Who hath known her wise counsels ?” *Radix sapientiæ cui revelata est ? et astutias illius quis agnovit ?** In general, the leaves of aquatic plants appear, from their extreme mobility, very much adapted to the purpose of renewing the air of humid places, and of producing, by their movements, that drying of the ground to which I have just alluded. Such are those of reeds, of poplars, of aspens, of birches, and even of willows, which are sometimes in motion, though there is not the slightest degree of wind perceptible.

It is farther remarkable, that most of these vegetables emit a very pleasing smell ; among others, the poplar and the birch, especially in the Spring ; and that a great number of aromatic plants thrive by the water’s side, as mint, sweet marjoram, ciperus, the sweet smelling rush, the iris, the *calamus aromaticus* : And, in the Indies, the spice plants, such as the cinnamon tree, the nutmeg and the clove. Their perfumes must contribute very powerfully to diminish the mephitic exhalations, which are natural to marshy and humid places. They have, likewise, many uses relatively to animals, such as affording a shade to the fishes which resort thither, in quest of a shelter from the scorching heat of the Sun.

But one conclusion we may certainly deduce, in favour of our improvements in culture, from the observations now made ; namely this, that in the cultivation of plants, the pedicle of whose leaves presents no impress of a canal, it is necessary to water them copiously ; for, in this case, they are naturally aquatic. The nasturtium, the mint, and the sweet marjoram, consume a prodigious quantity. But when plants are provided with a canal, they must be watered more sparingly, for this demonstrates them to be originally natives of the mountains. The deeper this canal is, the less artificial watering do they re-

* Ecclesiasticus, chap. i. ver. 6.

quire. Every gardener knows, that if you frequently water the aloës, or the taper of Peru, you will kill them.

The seeds of aquatic plants have forms not less adapted, than those of their leaves, to the places where they are destined to grow; they are all constructed in a manner the most proper for sailing off. Some of them are fashioned into the figure of shells, others into boats, rafts, skiffs, single and double canoes, similar to those of the South Seas. I can have no doubt, that, by an attentive study of this part alone, a great number of very curious discoveries might be made, respecting the art of crossing currents of every sort; and I am persuaded that the first men, who were much better observers than we are, copied their different methods of travelling, by water, after those models of Nature, of which we, with all our pretensions to discovery, are but feeble imitators.

The aquatic, or maritime pine, has its kernels inclosed in a kind of little bony shoes, notched on the under side, and covered over, on the upper, with a piece resembling a ship's hatch. The walnut, which delights so much in the banks of rivers, has its fruit contained in two little boats, whose apertures are perfectly fitted to each other. The hazel, which becomes so bushy on the brink of rivulets; the olive, which is enamoured of the sea shore to such a degree, that it degenerates in proportion as you remove it thence, carry their seed inclosed in a species of little casks, capable of holding out the longest voyages. The red berry of the yew, whose favourite residence is the cold and humid mountain, by the side of a lake, is hollowed into a little bell. This berry, on dropping from the tree, is at first carried down, by its fall, to the bottom of the water; but it returns instantly to the surface, by means of a hole, which Nature has contrived, in form of a navel, above the seed. In this aperture is lodged a bubble of air, which brings it back to the surface of the water, by a mechanism more ingenious than that of the div-

er's bell, in this, that the vacuum of the diving bell is undermost, and in the berry of the yew it is uppermost.

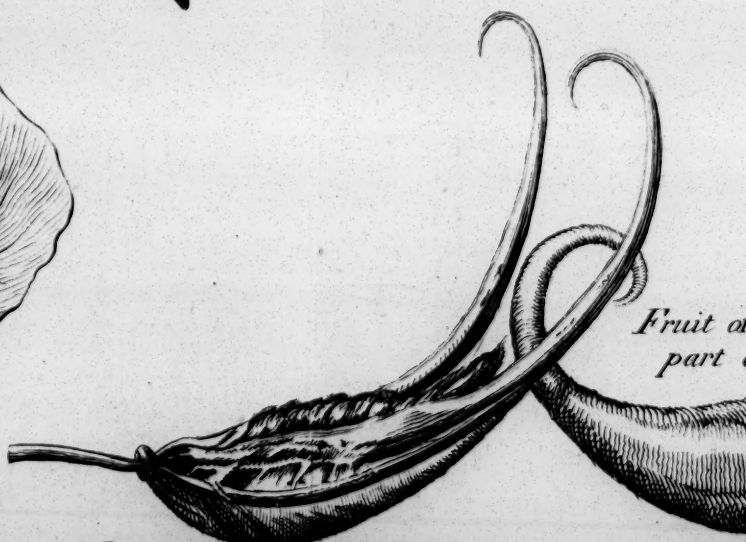
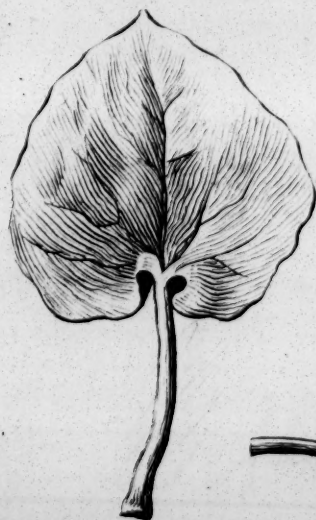
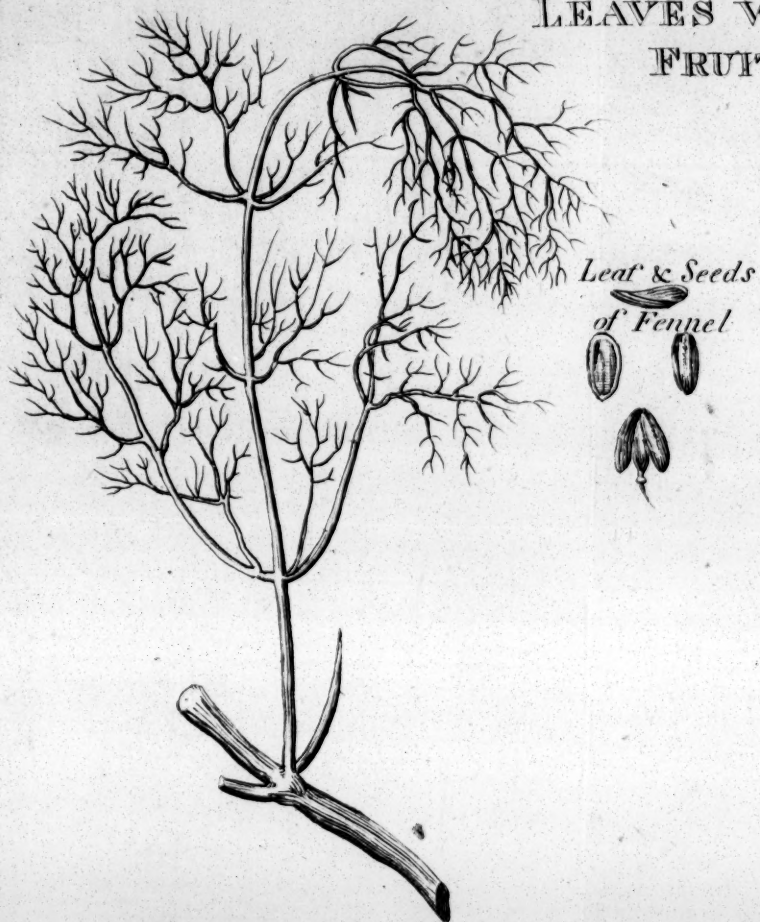
The forms of the seeds of aquatic plants are still more curious; for, universally, Nature redoubles her skill and exertions in favour of the little and the weak. That of the bulrush resembles a lobster's eggs; that of fennel is a real canoe in miniature, hollowed in the middle, with both ends raised into a prow. There are others grooved into each other resembling pieces of wood disposed for a float, and worm eaten; such are those of the horned poppy. Those which are destined to thrive on the brink of waters destitute of current, are wafted by sails; such is the seed of a scabious plant of our own country, which grows on the border of morasses. Besides, the difference of this from the other species of scabious, whose seeds are crowned with pronged hairs, in order to fasten themselves on the hairs of the animals which transplant them, the one, last mentioned, is overtopped by a half bladder open, and resting on its summit like a gondola. This half bladder serves it, at once, as a sail by water, and as a vehicle by land. These means of natation, though endlessly varied, are common, in all climates, to the grains of aquatic plants.

The almond of the river of the Amazons, known by the name of *totoca*, is inclosed in two shells, exactly similar to those of an oyster. Another fruit on the strand of the same river, which abounds in almond trees, has a perfect resemblance in colour and form, to an earthen pot, with its little lid;* it goes by the name of the monkey's porridge pot. Others are formed into large bottles, as the fruit of the great gourd. There are seeds incrustated in a coat of wax, which makes them float, such are the berries of the wax tree, or royal pimenta of the shores of Louisiana. The formidable apple of the mancenilla, which grows on the

* See engravings of most of those seeds, in *John de Laet's History of the Westindies*.



LEAVES WITHOUT AN
FRUITS OF VEGE



*Leaf & Fruit of the Martinia
of the shores of la Vera Cruz*

AT AN AQUEDUCT, & NAUTICAL
VEGETABLES OF THE SHORE.



*Leaf & Fruit
of the Walnuttree.*

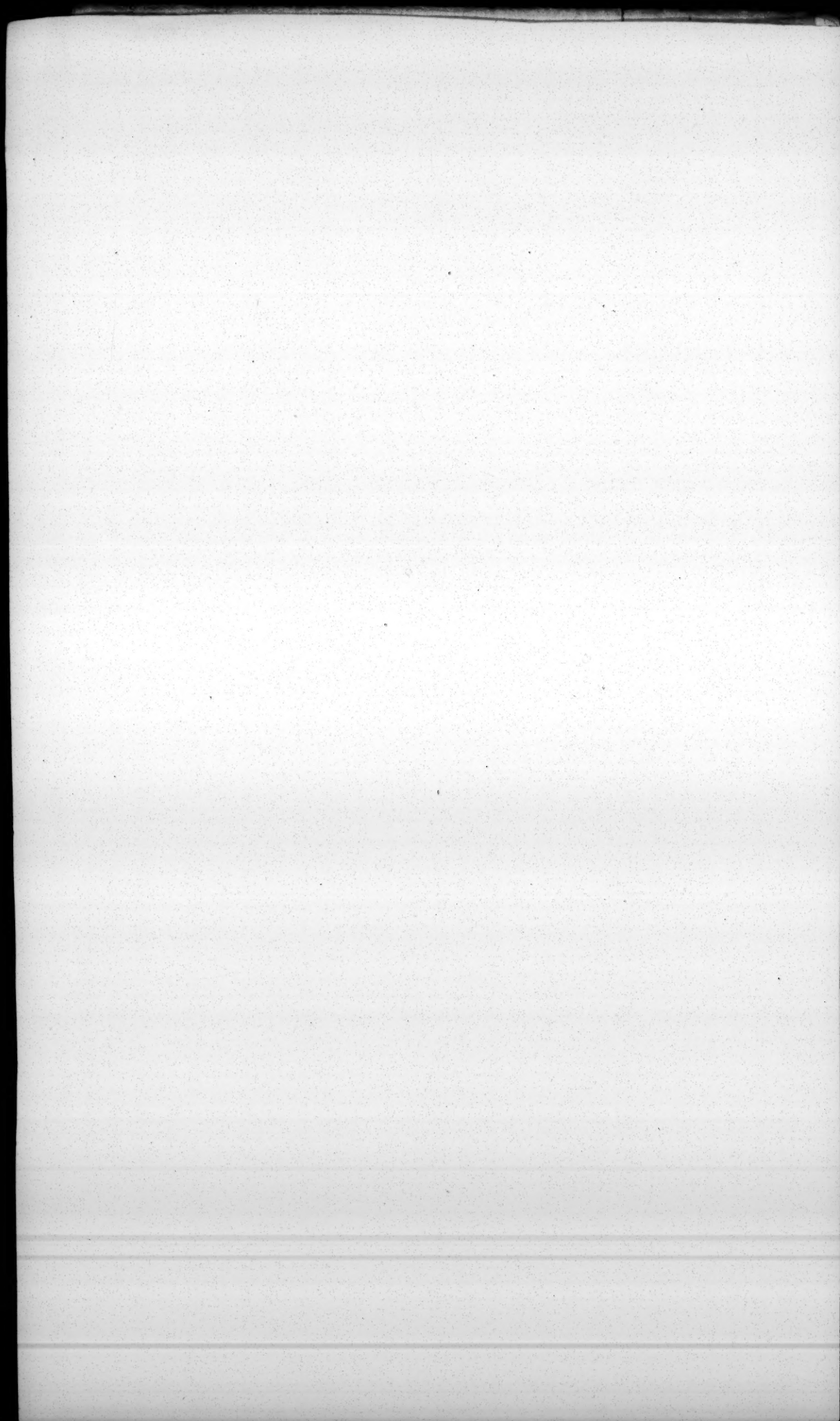


*Fruit of the Martinia with
part of its husk.*



*Leaf &
Seeds of the
Nasturtium*





sea shore of the islands situated between the Tropics, and the fruit of the manglier, which grows there actually in the salt water, are almost ligneous. There are others with shells similar to the sea urchin, without prickles. Many are coupled, and perform their voyage like the double canoe, or balsa, of the South Sea. Such is the double cocoa of the Sechielles Islands.

If you examine the leaves, the stems, the attitudes and the seeds of aquatic plants, you will always remark in them characters relative to the places where they are destined to grow, and in harmony with each other; so that, if the seed has a nautical form, its leaves are deprived of an aqueduct; just as in mountain plants, if the grain is volatile, the pedicle of the leaf, or the leaf altogether, presents a channel.

I shall assume, as an instance of the nautical harmonies of plants, the nasturtium, with which every one is acquainted. This plant which bears flowers so agreeable, is one of the cresses of the rivulets of Peru. It must be observed, first, that the foot stalks of its leaves have no conduit, like those of all aquatic plants; they are inserted in the middle of the leaf, which they support like an umbrella, to ward off from them the water which falls from Heaven. Its seed, when fresh, has exactly the form of a boat. The upper part is raised into a slope, like a bridge to let the water run off; and you distinguish perfectly, in the lower part, a poop and a prow, a keel and a bottom. (*See the annexed Plate.*) The little furrows of the seed of the nasturtium are characters common to most nautical grains, as well as the triangular forms, and those of the kidney or keel. Those furrows, undoubtedly, prevent them from rolling about in all directions, constrain them to float along lengthwise, and give them the direction the best adapted to the track of the water, and to the passage of the narrowest straits. But they have a character still more general; it is this, that they swim in their state of maturity, which is not the case with grains

destined to grow in the plains, such as pease and lentils, which sink to the bottom.

Some species of these, nevertheless, such as the French bean, sink, at first, to the bottom, and rise to the surface when penetrated with the water. Others, on the contrary, float at first, and sink afterward. Such is the Egyptian bean, or the seed of the colocasia, which grows in the waters of the Nile. In order to sow it, you are under the necessity of rolling it up in a ball of earth; and in that state it is thrown into the water. Without this precaution, not one would remain on the shores where you would wish it to grow. The natality of aquatic seeds is, undoubtedly, proportioned to the length of the voyages which they have to perform, and to the different gravity of the waters in which they are destined to swim. There are some which float in sea water, and sink in fresh, which is lighter than sea water by one thirty second part: Such precision is in the balancing of Nature! I believe that the fruit of the great India chestnut, which thrives on the shores of the salt creeks of Virginia are in this situation. In a word, I am so entirely convinced of all the relations which Nature has established among her Works, as to conclude, that the time when the seeds of aquatic plants drop, is regulated, in most cases, by that of the overflowing of the rivers where they grow.

It is a speculation well worthy of the attention of the philosophic mind, to trace those vegetable fleets sailing along, night and day, with the current of the rivulets, and arriving, undirected by any pilot, on unknown regions. There are some which, by the overflowing of the waters, now and then lose themselves in the plains. I have seen them, sometimes accumulated upon each other, in the bed of torrents, presenting around the pebbles where they had germinated, waves of verdure of the most beautiful sea green. You would have thought that *Flora*, pursued by some River god, had dropped her basket in the urn of that Deity. Others more fortunate, issuing from the sources of

some stream, are caught by the current of the greater rivers, and conveyed away to embellish their distant banks with a verdure not their own.

There are some which cross the vast Ocean; and, after a long navigation, are driven, by the very tempests, on the regions which they adorn and enrich. Such are the double cocoas of the Sechelles, or Mahé Islands, which the Sea carries regularly every year a distance of four hundred leagues, and lands them on the coast of Malabar. The Indians, who inhabit it, were long under the persuasion, that those annual presents of the Ocean must have been the produce of a palm tree that grew under its billows. They gave them the name of marine cocoa nuts; and ascribed wonderful virtues to them. They set as high a value upon them as upon ambergris; and to such a pitch was this extravagance carried, that many of those fruits have been sold as high as a thousand crowns a piece. But the French having, some years ago, discovered the Island of Mahé, which produces them, and which is situated in the fiftieth degree of South Latitude, imported them in such quantities to India, that they sunk at once in value and in reputation; for men, in every country, prize those things only which are rare and mysterious.

In every island where the eye of the traveller has been able to contemplate the primordial dispositions of Nature, he has found their shores covered with vegetables, all the fruits of which possess nautical characters. *James Cartier* and *Champlain* represent the strands of the lakes of North America as shaded by stately walnut trees. *Homer*, who has so attentively studied Nature, at times, and in places, where she still retained her virgin beauty, has planted the wild olive along the shores of the island on which *Ulysses*, floating upon a raft, is thrown by the tempest. The navigators who have made the first discoveries in the seas of the East Indies, frequently found in them shallows planted with cocoa trees. The Sea throws such quantities of fennel seed on the shores of Madeira, that

one of its bays has obtained the name of Funchal, or Fensnel Bay.

It was by the course of those nautical seeds, too carelessly observed by modern Seamen, that the Savages formerly discovered the islands to windward of the countries which they inhabited. They formed conjectures respecting a tree at a great distance, on seeing its fruit cast upon their shores. By similar indications, *Christopher Columbus* acquired the assurance, that another world existed. But the regular winds and currents from the East, in the South Sea, had carried them long before to the Nations of Asia; of which I shall say something toward the end of this Study.

There are, besides, vegetables of an amphibious nature. They are disposed in such a manner, that one part of their foliage raises itself toward Heaven, and the other forms an arcade, and bends downward to the ground. Nature has given to their seeds, likewise, the power of at once flying and swimming. Such is the willow, the seed of which is enveloped in a cobweb down, which the winds transport to a great distance, and which floats along the surface of the water, without wetting itself, like the downy feathers of the duck. This down is composed of small capsules, like the bottom of a lamp, and with two beaks, filled with seeds, which are crowned with a plume: So that the wind conveys those capsules through the air, and likewise transports them, by sailing, along the face of the water. This configuration was admirably adapted, to be the vehicles of the seeds of plants which grow by the side of stagnant waters and lakes. The same thing holds as to the seeds of the poplar; but those of the alder, which grows on the banks of rivers, have no plumage, because the current of the stream is designed to convey them from place to place.

The seeds of the fir, and of the birch, have, at once, volatile and nautical characters; for the fir has its kernel attached to a membranous wing; and the birch has its

grain embraced by two wings, which give it the appearance of a little shell. These trees grow, at once, on the wintry mountains, and on the margin of the lakes of the North ; their seeds had occasion not only to sail over stagnant waters, but to be transported through the air over the snows, in the midst of which they take delight. I have no doubt that there may be species of these trees, the seeds of which are altogether nautical. Those of the linden tree are carried in a spherical body, similar to a little bullet. This bullet is affixed to a long tail, from the extremity of which descends obliquely a follicle of considerable length, whereby the wind carries it away to a great distance, spinning it round and round. When it drops into the water, it plunges about the length of an inch in it, and serves, in some sort, as ballast to its tail, and to the little leaf attached to it, which thus, being brought to a vertical situation, performs the functions of a mast and a sail. But the examination of so many curious varieties would carry me too far.

This would be the proper place to speak of the roots of vegetables ; but I am little acquainted with what passes under ground. Besides, in all Latitudes, on heights, as well as by the water's side, we find the same substances nearly, muds, sands, pure mould, rock, which must produce a much greater resemblance in the roots of plants than in the other parts of their vegetation. I have no doubt, however, that Nature has established, on this subject, relations, the knowledge of which would be highly useful, and that a cultivator, somewhat experienced, might be able, by inspecting the root of a vegetable, to determine the species of soil best adapted to it. Those which are very hairy seem most proper for sandy grounds. The cocoa tree, which grows to a very large size on the shores of the Torrid Zone, thrives in pure sand, which it interlaces with such a prodigious quantity of hairy fibres, as to form a solid mass around it. It is on this basis that it effectually resists the most violent tempests, in the midst

of a moving soil. What is singularly remarkable in the case of this plant, it never succeeds so well as in the sand on the sea shore, and generally languishes in the interior of a country.

The Maldivia Islands, which are, for the most part, nothing but sandy shallows, are the most renowned regions of all Asia, for the abundance and the beauty of their cocoa trees. There are other vegetables of the shores, the roots of which are drawn out like cords. This configuration renders them exceedingly proper for binding together the ground, and thereby defending it against the inroads of the watery element. Such are, among ourselves, the alder, the reed, but, above all, a species of dogs' grass, which I have seen very carefully cultivated in Holland along the dikes.

Bulbous plants appear, in like manner, to take pleasure in soft muds, into which they cannot penetrate very far, from the roundness of their bulbs. But the elm extends its roots at pleasure on the declivity of the mountain; and the oak inserts his sturdy pivots into it, to lay hold of the successive strata of which it is composed. Other plants preserve, on the high grounds, by their creeping foliage and their superficial roots, the emanations of dust which the winds there deposit. Such is the *anemone nemorosa*. If you find a single foot of it on a hill, in a wood not greatly frequented, you may rest assured, that it diffuses itself like a net work through the whole extent of that wood.

There are trees, the trunks and the roots of which are admirably contrasted with obstacles which appear to us accidental, but which provident Nature foresaw. For example, the cypress of Louisiana grows with its foot in the water, chiefly on the banks of the Méchassipi, whose vast shores it magnificently shades. It rises there to a height which surpasses that of almost any of the trees of Europe.*

* See Father Charlevoix's History of New France, vol. iv.

Nature has given to the trunk of this stately tree, a circumference of more than thirty feet, in order to enable it to resist the ices from the lakes of the North, which discharge themselves into that river, and the prodigious rafts of timber which float down its stream, and which have obstructed most of its mouths to such a degree, as to interrupt the navigation to vessels of any considerable burthen. And, to put it beyond a doubt, that she designed the thickness of its trunk for withstanding the shock of floating bodies, it is remarkable, that, at the height of six feet, she suddenly diminishes the size of it at least a third, the full magnitude having become superfluous at that degree of elevation : And for the purpose of securing it in another manner, still more advantageous, she raises out of the root of the tree at four or five feet distance all around, several large stumps from one foot to four feet high. These are not shoots ; for their head is smooth, and bears neither leaves nor branches : They are real ice breakers.

The tupelo, another great tree of Carolina, which grows likewise by the water's side, but in creeks, has nearly the same dimensions at its base, excepting the ice breakers, or pallifades. The seeds of those trees are fluted, as I have already observed to be the case with aquatic seeds in general ; and that of the cypress of Louisiana differs considerably, by its nautical form, from that of the cypress of the mountains of Europe, which is volatile. These observations are so much the more worthy of credit, that Father *Charlevoix*, who, in part, relates them, deduces no consequence whatever from the facts, though he was abundantly capable of interpreting their use.

It must now be apparent of what importance it is to connect the study of plants with that of the other Works of Nature. It is possible to ascertain, by their flowers, the exposure to the Sun which is best adapted to them : By their leaves, the quantity of water that is necessary to them ; by their roots, the soil which is most suitable ; and by their fruits, the situations in which they ought to be

placed, together with new relations to the animals which feed upon them. By fruit I mean, as Botanists likewise do, seed of every species.

The fruit is the principal character of the plant. Of this we may form a judgment, first, from the care which Nature has bestowed on its formation and preservation. It is the ultimate term of her productions. If you examine, in a vegetable, the different envelopes which inclose its leaves, its flowers, and its fruits, you will perceive a most wonderful progression of pains and precautions. The simple leaf buds are easily distinguishable from the simplicity of their cases. Nay, there are plants which have none at all, as the shoots of the gramineous, which start immediately out of the earth, and stand in no need of any foreign protection. But the buds which contain flowers are provided with sheaths, or lined with down, as those of the apple tree ; or cased over with glue externally, as those of the great India chestnut ; or are inclosed in bags, as the flowers of the narcissus ; or secured in some way or another, so as to be very distinguishable, even before their expansion.

You afterwards perceive, that the care employed in dressing out the flower, was entirely destined to the fecundation of the fruit ; and that when this is once formed, Nature redoubles her precautions, both externally and internally, for its preservation. She gives it a placenta, she envelops it in pellicles, in shells, in pulps, in pods, in capsules, in husks, in skins, and sometimes in a case of thorns. A mother cannot pay more attention to the cradle of her infant. In process of time, in order that her grown child may be enabled to go abroad, and look for a settlement in the world, she crowns it with a tuft of plumage, or incloses it in a shell : Furnishes it with wings to fly away through the air, or with a bark to sail off along the face of the water.

There is something still more marked, to arrest our observation, in favour of the fruit. It is this, that Nature

frequently varies the leaves, the flowers, the stems, and the roots of a plant ; but the fruit remains constantly the same, if not as to its form, at least as to its essential substance. I am persuaded that, when she was pleased to create a fruit, it was her intention that it should have the power of reproducing itself on the mountains, in the plains, amidst rocks, in sands, on the brink of waters, and under different Latitudes ; and, in order to adapt it to its situation, she varied the watering pot, the mirror, the prop, the attitude, the buttress, and the fur of the vegetable, correspondingly to the Sun, to the rains, to the winds and to the soil. To this intention, I believe, we ought to ascribe the prodigious variety of species in every genus, and the degree of beauty which each attains, when in the situation that is natural to it. Thus, in forming the chestnut to reach perfection on the stony mountains of the South of Europe, and to supply the want of corn, which scarcely succeeds there, she placed it on a tree which in those regions attains magnificence from its adaptations.

I have eaten of the fruit of the chestnut tree of the Island of Corsica. It is as large as small hens' eggs, and makes excellent food. You may read, in a modern traveller, the description of a chestnut tree, which grew in Sicily, on one of the ridges of Mount *Ætna*. Its foliage is of such extent, that a hundred cavaliers could repose with ease under its shade. For that reason it obtained the name of *centum cavallo*. Father *Kircher* assures us, that he had seen, on the same mountain, in a place called *Trecaflagne*, three chestnut trees of such a prodigious size, that when they were felled, you might have lodged a large flock of sheep under covert of their bark. The shepherds employed them for this purpose, in the night time, and in bad weather, instead of penning up their charge in the fold. Nature has granted, to this stately vegetable, the faculty of collecting, on the steep mountains, the waters of the Atmosphere, by means of leaves formed like so many tongues ; and of penetrating, by means of its flurdy roots,

down to the very bed of fountains in despite of lavas and rocks.

Nature has been pleased, elsewhere, to produce the fruit of this tree with a degree of bitterness, for the use of some animal no doubt, on the brink of the salt water creeks, and arms of the Sea, in Virginia. She has bestowed on the tree which bears it, leaves disposed in form of a tile, a scaly bark, flowers different from those of the European chestnut tree, but adapted, unquestionably, to the humid exhalations, and to the aspects of the Sun to which it is exposed. In a word, she has transformed it into the great India chestnut. It arrives at much greater beauty in its native country, than in Europe. That of America is the maritime chestnut tree; and that of Europe is the chestnut tree of the mountains. She has placed, perhaps by a different kind of combination, this fruit, on the beech tree of our hills, the mast of which is evidently a species of chestnut.

Finally, by means of one of those maternal attentions which have induced her to suspend, even on herbs, the productions of trees, and to serve up the same dishes on the smallest tables, she has placed before us the same fruit in the grain of the black corn, which, in its colour, and its triangular form, resembles the seed of the beech, called in Latin *fagus*, whence this species of corn has obtained the name of *fagopyrum*. One thing, at any rate, is certain, namely, that independent of the mealy substance, we find, in the black corn, in the beechmast, and in the chestnut, similar properties, such as that of cooling excessive heat of urine.*

It was, in like manner, the intention of Nature to produce the acorn, in a great variety of exposures. *Pliny* enumerated, in his time, thirteen different species in Europe, one of them, which makes very excellent food, is that of the green oak. It is of this that the Poets speak,

* See *Chomel's Treatise on Common Plants*.

when they celebrate the felicity of the Golden Age, because its fruit then served as an aliment to Man. It is worthy of being remarked, that there is not a single genus of vegetable, but what gives in some one of its species, a substance capable of being converted into nourishment for mankind. The acorn of the green oak is, among the fruits of this genus of trees, the portion reserved for our use. Nature has been pleased, after making this provision for Man, to scatter the other species of the oak over the different soils of America, to supply the necessities of her other creatures. She has preserved the fruit, and has varied the other parts of the vegetable. She has placed the acorn, but with the leaves of the willow, on the plant, which has, for that reason, got the name of the willow leafed oak, and which thrives in that country by the water's side.* She has placed it, together with small and pendent leaves affixed to pliant tails, like those of the aspen, on the water oak, which grows there in the marshes. But when she intended to plant them in dry and parched soils, she united to them leaves of ten inches in breadth, adapted to the reception of rain water, such are those of the species known by the name of the black oak in that country.

It may be necessary farther to observe, that the place where any species of plant produces the finest fruit, determines its principal genus. Accordingly, though the oak has its species scattered about every where, it must be considered as of the genus of mountain trees ; because that which grows on the mountains of America, and there distinguished by the name of the chestnut leafed oak, yields the largest acorns, and is one of the greatest trees in that part of the world ; whereas the water oak, and the willow leafed oak, rise to no great height, and produce very small acorns.

* See the figures of it in Father Charlevoix's History of New France, vol. iv.

The fruit as we have seen, is the invariable character of the plant. To it, accordingly, Nature has likewise attached the principal relations of the animal kingdom to the vegetable kingdom. It was her intention that an animal of the mountains should find the fruit, on which he has been accustomed to live, in the plains, on the sand, among the rocks, when he is under the necessity of changing his country, and especially on the brink of rivers; when he descends thither to quench his thirst. I am not acquainted with a single mountain plant but what has some of its species, with their corresponding varieties, scattered over all situations, but principally on the margin of waters.

The mountain pine has its kernels mounted on wings, and the aquatic pine has its seed inclosed in a skiff. The seeds of the thistle, which grows on a parched soil, are furnished with plumes, to convey them from place to place: Those of the fullers' thistle, which thrives by the water's side, have none, because they had no occasion for any to assist them in swimming. Their flowers vary for similar reasons; and though Botanists have made two different genera of them, the goldfinch fails not to acknowledge this last as a real thistle. He rests himself upon it, when he finds it convenient to go and cool himself on some watery bank. He forgets, on beholding his favourite plant, the sandy downs where he was born, and cheers the banks of the rivalet, with the music of his song, and the beauty of his plumage.

It appears to me impossible to acquire any thing like a knowledge of plants, unless by studying their geography, and their ephemeris. Without this double illumination, which mutually reflects, their forms will be forever strange to us. The greatest part of Botanists, however, pay no manner of regard to this. In making their collections, they remark not the season at which plants grow, nor the place where, nor the aspect to which they are exposed. They carefully attend to all their intrinsic parts, and es-

pecially to their flowers; and after this mechanical examination, deposit them in their herbarium, and imagine they have a thorough knowledge of them, especially if they have had the good fortune to dignify them, by imposing some Greek name. They resemble a certain huffar, of whom I have heard, who, having happened to find a Latin inscription in brazen characters, on an antique monument, disengaged them one after another, and tumbled them together into a basket, which he dispatched to an Antiquarian of his friends, with a request that he would inform him what they meant. They no more lead us to an acquaintance with Nature, than a Grammarian would give us a relish for the genius of *Sophocles*, by presenting us with a naked catalogue of his tragedies, of the division of their acts and scenes, and of the number of verses which compose them. With equal absurdity are they chargeable who collect plants, without marking their relations to each other, and to the elements; they scrupulously preserve the letter, but suppress the sense of it. Far different was the manner in which a *Tournefort*, a *Vaillant*, a *Linnaeus*, prosecuted the study of Botany. If these learned men have not deduced any consequence from those relations, they have, at least, prepared the projecting stones of expectation, which promise the construction of a future fabric of science.

Though the observations which I have just made, respecting the elementary harmonies of plants, are but few in number, I have the confidence to affirm, that they are of very high importance to the progress of agriculture. The point in question is not to determine geometrically the genera of flowers, whose mirrors are the best adapted for reflecting the rays of the Sun in every point of Latitude; the glory of calculating their curves is reserved for future *Newtons*. Nature has outrun our most ardent wishes, in those places where she has been left at liberty to reestablish her own plans. We have it in our power to secure prosperity to ours, in a manner the most beneficial, by re-

ducing them into harmony with hers. In order to ascertain what plants are best adapted to succeed in such and such a district, you have only to pay attention to the wild plants which thrive there spontaneously, and which are distinguishable for their vigor and for their multitude: Then substitute in their place domestic plants, which have the same kind of flowers and leaves. Wherever umbelliferous plants grow, you may put in their room such of our culinary vegetables as have most analogy with them, from their leaves, their flowers, their roots and their grains, such as the *daucus* genus: The artichoke will there usefully replace the gaudy thistle; the domestic plum tree ingrafted on a wild stock of the same plant, in the very place where this last spontaneously sprung up, will become extremely vigorous. I am persuaded that by these natural approximations, advantage might be derived from the most barren sands and rocks; for there is not a single genus of wild plants but what contains a species fit for food.

But it was not sufficient for Nature to have established so many harmonies between plants, and the situations in which they were destined to vegetate, had she not likewise provided means for restoring them, when destroyed by the intolerant culture of Man. Let a piece of ground be left uncultivated, for ever so short a space of time, and you will presently see it clothed with vegetables. They grow there in such numbers, and so vigorously, that there is no husbandman capable of producing an equal quantity, on the same spot, let him take what pains he will. These shoots, however, so vigorous and so rapid, which frequently take possession of our dock yards of free stone, of our walls of ashlar, and of our courts paved with granite, are, in many cases, only a provisional culture. Nature, who is always advancing from harmony to harmony, till she has attained that point of perfection which she proposed to herself, sows, at first, with grasses and herbage of different species, all abandoned soils, waiting for an opportunity of exerting her powers, to raise on that very

spot vegetables of a higher order. On the rude neglected districts, where barren downs alone meet our eyes, posterity may behold stately forests arise.

We shall throw, as our custom is, a superficial glance on the very ingenious methods which Nature employs for preparing and conducting those vegetable progressions. We shall hence attain a glimpse, at least, not only of the elementary relations of plants, but of those which exist between their different classes, and which extend even to the animal kingdom. Vegetables, which are the most contemptible in the eyes of Man, are frequently the most necessary in the order of Creation.

The principal means employed by Nature for securing the growth of plants of every species, are the thorny plants. It is very remarkable, that plants of this description are the first which appear on lands in fallow, or in forests which have been cut down. They are, in truth, wonderfully well adapted to promote foreign vegetations, because their leaves with deep incisions, like those of the thistle and echium, or their sprigs bent into an arch, as those of the bramble, or their horizontal and interlaced branches, like those of the black thorn, or their boughs bristled with briars and unprovided with leaves, as those of the sea rush, leave underneath and around them many intervals through which other vegetables may arise, and find protection from the tooth of most quadrupeds. Nurseries of trees are frequently to be found in their bosom. Nothing is more common in coppice woods than to see a young oak start out of a tuft of brambles, which enamels the earth all around, with its clusters of prickly flowers; or a young pine arise out of a yellow brake of marine rushes.

When these trees have once acquired a certain degree of growth and size, they stifle, by their shade, those thorny plants, which subsist no longer, except along the skirts of the woods, where they enjoy air sufficient for their vegetation. But in this situation, such plants are still going

on to extend the empire of their superiors, from year to year, over the plains. Thus, the thorny plants are the original cradles of the forests; and the scourge of the agriculture of Man, is the bulwark of that of Nature.

Man has, however, imitated, in this respect, the processes of Nature; for if he wishes to protect the newly sown seeds of his garden, he finds it frequently necessary to cover them with prickly branches of one sort or another. It appears to me probable, that there is not a heath but what, in time, might become a forest, were their commoners restrained from driving their flocks thither to pasture, for the cattle crop the tender shoots of the trees as fast as they spring up. This, in my opinion, is the reason why the declivities of the lofty mountains of Spain, of Persia and of many other parts of the World, are not clothed with trees: It is because of the numerous flocks of sheep which are driven thither, in Summer, and which roam over their different chains. I am fully convinced that those mountains were covered, in the earlier ages of the World, with forests which were laid low by their first inhabitants; and that they would resume their ancient clothing, though now naked and desert, were the cattle to pasture on them no longer. It is very remarkable, that those elevated regions are sowed over with prickly plants, just as our heaths generally are.

Don *Garcias de Figueroa*, Ambassador from Spain at the Court of *Cha Abas*, King of Persia, relates, in the account which he has given of his journey, that the lofty mountains of Persia, which he crossed, and where the Turcomans are continually straying, as they tend their fleecy charge, were covered with a species of thorny shrub, which grew luxuriantly in the most parched situations. This same shrubbery served as a retreat to a great number of partridges.

From this circumstance we take occasion to observe, that Nature employs the birds, particularly, to sow the thorny plants in places the steepest and most inaccessible.

They are accustomed to retire thither in the night, and there deposit, with their dung, the stony seeds of the bramble berry, of the berry of the eglantine, of the barberry and of most thorny shrubs, which, from relations no less wonderful, are indigestible in their stomach.

Birds have, besides, particular harmonies with those vegetables, as we shall make appear in its proper place. Not only do they find on them a plentiful supply of food, and shelter under them, but downs for lining their nests, as on thistles, and on the cotton tree of America; so that if many of them resort for safety to the elevation of towering trees, others find it in the thorny brake. There is not a single bush but what has its peculiar bird.

Independently of the plants proper to each situation, and which are there domesticated, there are some in a state of incessant peregrination, and flit round the earth, without settling in any fixed abode. We can easily have a conception of the cause of this constant removal, by supposing, what is actually the truth, that several of such plants shed their seeds only at the season when certain regular winds blow, or at certain revolutions of the currents of the Ocean. Whatever may be in this, I am of opinion that we must rank, under this description, many plants which were known to the Ancients, but are not now to be found. Such, among others, is the celebrated *lazerpitium* of the Romans, the juice of which, called *lazer*, sold for its weight in silver. This plant, according to *Pliny*, grew in the vicinity of the city of Corenum, in Africa; but had become such a rarity in his time as hardly any where to be seen. He tells us that a single plant of it had been found, under the reign of *Nero*, and that it was sent to this Prince as a great curiosity.

Modern Botanists pretend, that the *lazerpitium* is the same plant with the *silphium* of our gardens. But they are evidently in an error, from the descriptions which the Ancients, and, among others, *Pliny* and *Dioscorides* have left us of it. For my own part, I have no doubt that the

lazerpitium is of the number of the vegetables which are destined to flit along the Earth, from East to West, and from West to East. It is, perhaps, at present, on the western shores of Africa, whither the easterly winds may have conveyed its seeds; perhaps, likewise, by the revolutions of the westerly winds, it may have returned to the place where it was in the days of *Augustus*; or it may have been conveyed into the plains of Ethiopia, among Nations totally unacquainted with its pretended wonderful qualities.

Pliny enumerates a great many other vegetables, which are, at this day, to us equally unknown. It may merit observation, that those vegetable apparitions have been contemporary with several species of flitting birds, which have likewise disappeared. It is well known that there are several classes of birds, and of fishes, which do nothing but migrate incessantly over the Earth and through the Seas; some, in a certain revolution of days; others, at the end of a certain period of years. Many plants may be subjected to a similar destiny. This Law extends even to the Heavens, in which some new star is, from time to time, making its appearance. Nature, as I think, has disposed her Works in such a manner, as to have always some novelty in reserve, in order to keep Man continually in exercise. She has established, in the duration of the existence of the different beings of each kingdom, concerts of a moment, of an hour, of a day, of a moon, of a year, of the life of a man, of the duration of a cedar, and, perhaps, of that of a globe: But this, undoubtedly, is known to the SUPREME BEING alone.

I am persuaded, at the same time, that the greatest part of flitting plants must have a principal centre, such as a steep rock, or an island in the midst of the Sea, from whence they diffuse themselves over all the rest of the world. This leads me to deduce, what I consider as an irrefragable argument in support of the recent Creation of our Globe; it is this, were the Globe of very remote

antiquity, all the possible combinations of the propagation of plants by seed, would have been already completed all over the World. Thus, for example, there would not be an uninhabited island and shore of the Seas of India, which you would not find planted with cocoa trees, and sown with cocoa nuts, which the Ocean wafts thither every year, and which it scatters alternately on their strands, by means of the variety of its monsoons and of its currents. Now, it is unquestionably certain, that the radiations of that tree and its fruit, the principal focusses of which are in the Maldivia Islands, are not hitherto diffused over all the islands of the Indian Ocean.

The Philosopher *Francis Leguat*, and his unfortunate companions, who were, in the year 1690, the first inhabitants of the small Island of Rodriguez, which lies a hundred leagues to the eastward of the Isle of France, found no cocoa trees in it. But, precisely at the period of their short residence there, the Sea threw upon the coast several cocoa nuts in a state of germination; as if it had been the intention of Providence to induce them, by this useful and seasonable present, to remain on that island, and to cultivate it.

Francis Leguat, who was unacquainted with the relations which seeds have to the element in which they are designed to grow, was very much astonished to find that those fruits, which weighed from five to six pounds, must have performed a voyage of sixty or fourscore leagues, without being corrupted. He took it for granted, and he was in the right, that they came from the Island of St. Brande, which is situated to the North East of Rodriguez. Those two desert islands had not, as yet, from the Creation of the World, communicated to each other all their vegetables, though situated in a current of the Ocean which sets in alternately, in the course of one year, for six months toward the one, and six months toward the other.

However this may be, they planted those cocoa nuts, which, in the space of a year and a half, sent out shoots

of four feet in height. A blessing from Heaven, so distinctly marked, had not the power of detaining them in that happy island. An inconsiderate desire of procuring for themselves women constrained them to abandon it, notwithstanding the remonstrances of *Leguat*, and plunged them into a long series of calamities, which few of them were able to survive. For my own part, I can entertain no doubt, that had they reposed that confidence in Providence which they had reason to do, its care would have conveyed wives for them into that desert Island, as it had sent to them the gift of the cocoa nut.

To return to the subject of vegetable navigation; all the combinations and the versatilities of their sowings, would have been long ago completed in islands lying between the same parallels, and in the same monsoons, if the World had been eternal. The double cocoa nuts, the nurseries of which are in the Sechelles Islands, would have diffused themselves, and would have had time to germinate on the Malabar coast, on which the Sea is from time to time throwing them. The Indians would have planted upon their shores those fruits to which they ascribed virtues so miraculous, while the palm tree, which bears them, was so entirely unknown but twelve years ago to the people of this coast, that they believed them to be natives of the bottom of the Sea, and thence gave them the appellation of marine cocoa nuts. There are, in like manner, a multitude of other fruits between the Tropics, of which the primordial stocks are in the Moluccas, in the Phillippines, in the islands of the South Sea, and which are entirely unknown on the coasts of both Continents, and even in the adjacent islands, which, undoubtedly, would have become there the objects of cultivation to their inhabitants, had the Sea been allowed sufficient time to multiply the projection of them on their shores.

I shall pursue this reflection no farther; but it evidently demonstrates the newness of the World. Were it eternal, and exempted from the care of a Providence, its veg-

etables would long since have undergone all the possible combinations of the chance which sows them. We should find their different species in every situation where it was possible for them to grow. From this observation I deduce another consequence, namely this, That the AUTHOR of Nature evidently intended to link Mankind together, by a reciprocal communication of benefits, the chain of which is, as yet, very far from being completed. Where is, for example, the benefactor of Humanity, who shall transport to the Ostiaks and the Samoïèdes of Waigat's Strait, Winter's tree from the Straits of Magellan, the bark of which unites the flavour of cloves, of pepper and of cinnamon? And, Who is the man that shall convey to Magellan's Strait the pease tree of Siberia, to feed the starving Patagonian?

What a rich collection might Russia make, not only of the trees which thrive in the northern and the southern regions of America, but of those which, in all parts of the World, crown the lofty, ice covered mountains, whose elevated ridges have a temperature approaching to that of her plains? Wherefore beholds she not her forests enriched with the pines of Virginia, and with the cedars of Mount Lebanon? The desert shores of the Irtis might every year clothe themselves with the same species of oats wherewith so many Nations, inhabiting the banks of the rivers of Canada are principally supported. Not only might she collect in her plains the trees and the plants of cold Latitudes, but a great number of annual vegetables, which grow during the course of a Summer, in warm and temperate Latitudes. I know, by experience, that the Summer's heat is as powerful at Petersburg as under the Line.

There are, besides, parts of the ground, in the North, which have configurations perfectly adapted to afford a shelter against the northerly winds, and to multiply the warmth of the Sun. If the South has its icy mountains, the North has its reverbatory valleys. I have seen one

of those small valleys, near Peterfburg, at the bottom of which flows a brook that never freezes, even in the midft of Winter. The rocks of granite, wherewith Finland is roughened all over, and which, according to the report of Travellers, cover moft of the lands of Sweden, of the fhores of the Frozen Ocean, and all Spitzbergen, are fufficient for producing the fame temperatures, in many places; and for diminifhing in them, to a confiderable degree, the feverity of the cold.

I have feen, in Finland, near Wiburg, beyond the fixty firft degree of Latitude, cherry trees entirely expofed to the weather, though thefe trees are natives of the forty fecond degree; that is, of the kingdom of Pontus, from whence *Lucullus* transplanted them to Rome, after the defeat of *Mithridates*. The peasantry of that Province cultivate tobacco with fuccefs, which is a much more fouthery plant, being originally a native of Brazil. It is, I admit, an annual plant, and that it does not acquire, in its northern fituation, a very high degree of perfume; for they are under the neceffity of expofing it to the heat of their ftoves, in order to bring it to a ftate of perfect maturity. But the rocks, with which Finland is covered over, would undoubtedly prefent, to attentive eyes, reverberating fituations, which might bring it to a fufficient degree of maturity, without the aid of artificial heat.

I myfelf found, not far from the city of Fredericksbam, upon a dunghill, under the fhelter of a rock, a very lofty tuft of oats, the produce of a fingle feed, confifting of thirtyfeven ftalks, loaded with as many ears completely ripe, without reckoning a multitude of other fmall fucklers. I gathered it with an intention of having it prefented to her Imperial majefty, *Catharine II*, by my General M. *Dubofquet*, under whose orders, and in whose company I was then vifiting the fortified places of that province: It was likewife his intention; but our Ruffian attendants, carelefs, as all flaves are, fuffered it to be loft. He was exceedingly vexed at this, as well as I: I cannot

help thinking, that a sheaf of corn so rich and beautiful, the produce of a province, considered, even at Petersburg, as smitten with sterility, because of the rocks which cover its surface, and procured for it, from ancient Geographers, the epithet of *lapidosa*, (stony) would have been as acceptable to her Majesty, as the huge block of granite which she has since had conveyed from thence, to be formed, at Petersburg, into the basis of a statue of *Peter* the Great.

I have seen in Poland, several private individuals cultivate the vine and the apricot tree with very great success. Mr. *de la Roche*, Consul from the prince of Moldavia, carried me, when at Warsaw, to a little garden, in the suburbs of that City, which produced to the occupier an annual revenue of one hundred pistoles, though it did not contain quite thirty of the last mentioned tree. It was totally unknown in that country a hundred and fifty years ago. The apricot was first introduced into it by a Frenchman, valet de chambre to a Queen of Poland. This man raised the fruit secretly, and made presents of it to the Grandees of the Country, pretending that he had received it from France, by the couriers of the Court. The great people did not fail to pay him magnificently for his presents; and this species of commerce became to him the foundation of an ample fortune, by means of which his great grand children are at this day the most opulent Bankers of that Country.

What I have said respecting the possibility of enriching Russia and Poland with useful vegetables, is not only in the view of acknowledging, the best way in my power, the gracious reception with which I was honoured by persons of rank, and by the Government of those Countries when I was a stranger among them; but because these indications tend equally to the improvement of France, the Climate of which is more temperate. We have icy mountains, capable of producing all the vegetables of the North; and reverberating valleys equally adapted to the

production of most of those of the South. It would not be proper, as our custom is, to make an effort to render this species of culture general through a whole district, but to set it a going in some little sheltered exposure, or small winding valley. The influence of these positions is of no great extent. Thus, the famous Constantia vine of the Cape of Good Hope succeeds perfectly only on a small spot of ground, situated at the bottom of a little hill, whereas the adjoining and surrounding vineyards do not produce the muscadine grape of any thing like the same quality. Of this, too, I have my own personal experience.

In France, it would be proper to look for sheltered aspects, such as we have been describing, in places where there are white stones in abundance, the colour of which is the best adapted to reverberate the rays of the Sun. Nay, I believe, that marl is indebted to its white colour, for part of the heat which it communicates to the lands on which it is spread; for it reflects upon them the rays of the Sun with so much activity, as to burn up the first shoots of many herbs. This is the reason, if I am not mistaken, why marl, which has, in other respects, the principles of fecundation within itself, kills a great many of the smaller herbs, which are accustomed to grow under the shade of the corn, and whose first leaves are more tender than those of corn, which is, in general, the most hardy of gramineous plants.

It would be farther necessary to look for those fortunate exposures in the vicinity of the Sea, and under the influence of its winds, which are so necessary to the vegetation of many plants, that several of them refuse to grow in the inland parts of a country. Such is, among others, the olive tree, which it has been found impossible to propagate in the interior of Asia and of America, though the Latitude be, in other respects, favourable. Nay, I have remarked, that it is not fruitful in islands, and on shores where it is excluded from the sea breezes. To this cause

I ascribe the sterility of those which have been planted in the Isle of France, on its western shore; for it is sheltered from the East winds by a chain of mountains. As to the cocoa tree, it will not thrive, between the Tropics, unless it has, if I may venture to say so, its root in the sea water. It is, I firmly believe, for want of those geographical considerations, and some others of a similar nature, that many plans of improvement in cultivation have failed in France, and in her Colonies.

However that may be, it might be possible to find, within the kingdom, an icy mountain, with, perhaps, a reverberating valley below. It would be a most agreeable employment to go in search of such a situation, and the greatest benefits might be derived from it. We might convert it into a Royal Garden, which should present to our Sovereign a spectacle of the vegetation of a multitude of climates, upon one line, of less than fifteen hundred fathoms of elevation. There he might bid defiance to the burning heat of the dog star, under the shade of cedars, on the mossy bank of a rivulet issuing from the snow; and, perhaps, escape the severity of Winter's cold, at the bottom of a valley with a southern aspect, under the palm tree, and amidst a field of sugar canes. We might there naturalize the animals which are the compatriots of those vegetables. He might hear the braying of the rein deer of Lapland, from the same valley in which he would see the peacocks of Java building their nests. This landscape would collect around him a part of the tributes of the Creation, and exhibit to him an image of the terrestrial paradise, which was situated, as I suppose, in a similar position. In serious truth, I cannot help expressing a wish, that our Kings would extend their sublime enjoyments, as far as the study of Nature has pursued its researches under their flourishing Empire*.

* *Nescia mens hominum fati sortisque futura!* Ah, blind to futurity! Little did good Saint Pierre think, that the ill fated Prince, for whom he took so

It now remains, that I examine the harmonies which plants form with each other. These harmonies constitute the inexpressible charms lavished on the sites which Nature has sowed and planted with her own hand; and they are to be the subject of the ensuing section.

VEGETABLE HARMONIES OF PLANTS.

We are going to apply to plants the general principles laid down in the preceding Study, by examining, one after another, the harmonies of their colours, and of their forms.

The verdure of plants, which is so grateful to the eye, is a harmony of two colours opposite in their elementary generation, of yellow, which is the colour of the Earth, and of blue, which is the colour of the Heavens. Had Nature dyed plants yellow, they would have been confounded with the ground; if blue, they would have been confounded with the Heavens and the Waters. In the first case, all would have appeared earth; in the second, all would have appeared sea: But their verdure gives them contrasts the most delightful with the grounds of this magnificent picture, and consonances equally agreeable with the yellow colour of the earth, and with the azure of the Heavens.

The green colour possesses this farther advantage, that it accords in a most wonderful manner with all the others, which arises from its being the harmony of the two

much delight to plant and decorate this earthly Paradise, was, in the course of a few fleeting years, to be dethroned, imprisoned, condemned, and publicly executed, in the Metropolis of his own Kingdom; and the very name of King proscribed by a Nation once enthusiastically attached to Royalty. How wonderful are the Works of Nature! How mysterious the Ways of Providence!

H. H.

extreme colours. Painters, who are endowed with taste, hang the walls of their exhibition rooms with green, in order that the pictures, of whatever colours they may be, may detach themselves from that ground without harshness, and harmonize upon it without confusion.*

Nature, not satisfied with this first general tint, has employed, in extending it over the ground of her scene, what Painters call *transitions*. She has appropriated a particular shade of bluish green, which we call sea green, to plants which grow in the vicinity of water, and of the Heavens. This is the shade which, in general, tinges the plants of the shores, as reeds, willows, poplars; and those of high grounds, as the thistle, the cypress, and the pine; and which makes the azure of the rivers to harmonize with the verdure of the meadows, and the azure of the Heavens with the verdure of the heights. Thus, by means of this light and fugitive tint, Nature diffuses delicious harmonies over the limits of the waters, and along the profiles of landscapes; and it is productive of a still farther magic to the eye, in that it gives greater apparent depth to the valleys, and more elevation to the mountains.

Something more wonderful still challenges our attention, namely this, that though she employs but one single colour in arraying so many plants, she extracts out of it a quantity of tints so prodigious, that each of those plants has its own, peculiar to itself, and which detaches it sufficiently from its neighbour to be distinguishable from it; and each of these tints is varying, from day to day, from the commencement of Spring, when most of them exhibit

* Undoubtedly, when they put on a green ground, pictures of plants, or landscapes, such pictures detach themselves from it but indifferently. There is, in my opinion, a tint better adapted to be the ground of a picture gallery; namely, gray. This tint, formed of black and white, which are the extremes of the chain of colours, harmonizes with every other, without exception. Nature frequently employs it in the Heavens, and on the Horizon, by means of vapours, and of clouds, which are generally of that colour.

themselves in a bloody verdure up to the last days of Autumn, when they are transformed into various yellows.

Nature, after having thus harmonized the ground of her picture, by means of a general colour, has detached from it every vegetable in particular, by means of contrasts. Such as are designed to grow immediately on the ground, on strands, or on dusky rocks, are entirely green, leaves and stems, as the greatest part of reeds, of grasses, of mosses, of tapers and of aloès; but those which are destined to arise out of the midst of herbage, have stems of different tints of brown; such are the trunks of most trees, and the stalks of shrubs. The alder, for example, which thrives amidst the grassy turf, has stems of an ash-coloured gray; but the wallwort, which entirely resembles it in all other respects, and which grows immediately on the ground, is green all over. The mugwort, which grows along hedges, has reddish stems, by which it is easily distinguishable from the neighbouring shrubs. Nay, there are, in every genus of plants, certain species which, by their shining colours, seem to have been formed for terminating the limits of their classes. Such is, in the forb genus, a species called the Canadian service tree, the branches of which are of a coral red. There are, in the willow tribe, osiers whose scions are as yellow as gold; but there is not a single plant which does not detach itself entirely from the ground which surrounds it by its flowers and by its fruits.

It is impossible to suppose that so many varieties should be mechanical results of the colour next to which bodies are placed; for example, that the bluish green of most mountain vegetables should be an effect of the azure of the Heavens. It is worthy of being remarked, that the blue colour is not to be found, at least as far as I know, in the flowers or in the fruits of lofty trees; for in this case, they would be confounded with the Heavens; but it is very common on the ground, in the flowers of herbs, such as the blue bottle, the scabious, the violet, the liverwort,

the iris, and many others. On the contrary, the colour of the earth is very common in the fruits of lofty trees, such as the chestnut, the walnut, the cocoa nut, and the cone of the pine. Hence we have an intimation, that the point of view of this magnificent picture was taken from the eye of Man.

Nature, after having distinguished the harmonic colour of each vegetable, by the contrasting colour of its flowers, and of its fruits, has followed the same laws in the forms which she has given them. The most beautiful of forms, as we have seen, is the spherical form; and the most agreeable contrast which it is capable of forming, is when found in opposition to the radiating form. You will frequently find this form and its contrast in the aggregation of the flowers that go by the name of radiated, as the daisy, which has a circle of small, white, divergent petals, surrounding its yellow disk: We find it likewise, with other combinations, in the blue bottle, in the asters and a multitude of other species. When the radiating parts of the flower are outermost, the spherical parts are inmost, as in the species which I have just named; but when the first are inmost, the spherical parts are outermost: This may be remarked in those whose stamina are drawn out into length, and the petals in spherical portions, such as the flowers of the hawthorn and of the apple tree, and most part of the rosaceous and liliaceous plants. Sometimes the contrast of the flower is with the surrounding parts of the plant. The rose is one of those in which it is most strongly marked: Its disk is formed of beautiful spherical portions, its calix is bristled with beards, and its stalk with thorns.

When the spherical form is found placed, in a flower, between the radiating and the parabolic, then there is a complete elementary generation, the effect of which is always highly agreeable; it is this, too, which is produced by most of the flowers that have just been named, by the profile of their calices, which terminate their projecting

stems. The nosegay girls are so sensible of the value of this combination, that they sell a single rose on its branch at a much higher price than they would ask for a large posy of the same flowers, especially if there are on it a few buds, which present the charming progressions of the florification. But Nature is so vast, and my incapacity so great, that I must restrict myself to throwing a single glance on the contrast, which arises from the simple opposition of forms: It is so universal, that Nature has given it to plants which had it not in themselves, by opposing them to others which have a configuration entirely different.

The species opposite in forms are almost always in company. When you fall in with an old willow, on the bank of a river, which art has not degraded, you may frequently see upon it a great convolvulus covering the radiated foliage of the tree with its own heart formed leaves, and its bell shaped white flowers, to make up the defect of apparent flowers, which Nature has denied to this tree. Different species of ropeweed produce the same harmonies on various species of high gramineous plants.

These plants, called creeping, are scattered over the whole vegetable kingdom, and are appropriated, as I suppose, to each vertical species. They have a great variety of methods of fixing themselves on the upright plant, which would alone merit a particular treatise. There are some which turn themselves spirally around the trunks of forest trees, such as the honeysuckle; others, as pease, have hands with three to five fingers, by which they lay hold of shrubbery: It is very remarkable, that those hands do not make their appearance till they have acquired a height at which they begin to have occasion for them as a support; others, as the bastard pomegranate, attach themselves in form of cork screw; others form a simple hook with the tail of their leaf, as the nasturtium: The pink employs a similar method of adhesion. These two beautiful flowers are supported in our gardens with rods;

but it would be a problem well worthy of the investigation of Florists, to ascertain what are the auxiliary plants, if I may call them so, to which these were designed to unite themselves, in the places where they are native : Delightful groups might be formed by their reunion.

I am persuaded that there is not a vegetable but what has its opposite in some parts of the Earth : Their mutual harmony is the cause of the secret pleasure which we feel in wild rural scenes, where Nature is at liberty to combine them. The fir tree rises, in the forests of the North, like a lofty pyramid, of a dark green, and with a motionless attitude. The birch is almost always found in its vicinity, and grows to nearly the same height, is of the form of an inverted pyramid, of a lively verdure, with a moveable foliage, continually playing about with every breath of the wind. The round leaved trefoil loves to grow in the midst of the fine grass, and to adorn it with its own flowery nosegay. Nay, I believe that Nature has made those deep incisions in the leaves of a great many vegetables, entirely in the view of facilitating alliances of this sort, and of opening a passage for the grasses, the verdure and delicacy of whose stems form with them an infinity of contrasts. Of this instances innumerable may be seen in uncultivated fields, where tufts of grass pierce through the broad plants of the thistle and the echium. This arrangement has, likewise, been made, in order that the grasses, which are most useful of all vegetables, might receive a portion of the rain from Heaven, through the interstices of the broad foliage of those privileged children of Nature, which would stifle every thing around them, but for those profound incisions. Nature does nothing merely for the pleasure of doing it, but always connects with it some reason of utility : This appears to me the so much more decidedly marked, that the incisions in leaves are much more common, and deeper in the plants and under shrubbery, which rise to no great height, than in trees.

The harmonies resulting from contrast, are to be found even in the waters. The reed, on the brink of rivers, raises into the air its radiating leaves, and its embrowned distaff, whereas the nymphæa extends at its feet a broad heart formed foliage, and roses of yellow gold : The one presents, on the waters, a continued pallifade, and the other a platform of verdure.

Similar oppositions present themselves in the most frightful of climates. *Martens*, of Hamburg, who has given us a very good account of Spitzbergen, tells us, that when the seamen belonging to the vessel in which he navigated along its coasts, heaved up the anchor, they seldom failed to bring up with it a very broad leaf of the *alga marina*, six feet in length, and attached to a tail as long : This leaf was smooth, of a brown colour, spotted with black, striped with two white stripes, and made in form of a tongue : He calls it the plant of the rock. But what is very singular, it was usually accompanied by a hairy plant, about six feet in length, like a horse's tail, and formed of hairs so fine, that one might denominate it, says he, the silk of the rock. He found on those dismal shores, where the empire of *Flora* is in such a state of desolation, the *cochlearia* (scurvy grass) and the sorrel, which grew together. The leaf of the first is rounded in form of a spoon, that of the other is lengthened into the shape of the iron head of an arrow. A Physician of considerable ability, of the name of *Bartholin*,* has observed, that the virtues of their salts are as opposite as their configurations ; those of the first are alkalies, those of the other are acids ; and from their union results what medical men call a neutral salt, which they ought rather to call a harmonic salt, the most powerful remedy which can be employed as an antiscorbutic, and the scurvy is a disease which is readily, and usually caught in those dreadful climates.

* See *Chomel's History of Common Plants*.

For my own part, I apprehend that the qualities of plants are harmonic as their forms ; and that as often as we find them grouped agreeably and constantly, there must result from the union of their qualities, for nourishment, for health, or for pleasure, a harmony as agreeable as that which arises from the contrast of their figures. This is a presumption that I could support, by referring to the instinct of animals, which, in browsing on the herbage, vary the choice of their aliments ; but this consideration would lead me away from my subject.

I should never come to a conclusion, were I to go into a detail respecting the harmonies of so many plants which we undervalue, because they are feeble or common. If we suppose them, for thought's sake, of the size of our trees, the majesty of the palm tree would disappear before the magnificence of their attitudes and of their proportions. Some of them, such as the echium, rise like superb candlesticks, forming a vacuum round their centre, and rearing toward Heaven their prickly arms, loaded, their whole length through, with lamps of violet coloured flowers. The verbascum, on the contrary, extends around it, its broad leaves of solemn drapery, and sends up from its centre a long distaff of yellow flowers, as salutary to the stomach, as grateful to the touch. The violet, of deep blue, contrasts, in the Spring, with the primrose, expanding its golden cup with a scarlet brim. On the embrowned angles of the rock, under the shade of ancient beech trees, the mushroom, white and round as an ivory piece for the chefs board, arises out of a bed of moss of the most beautiful green.

Mushrooms alone present a multitude of unknown consonances and contrasts. This class is, first, the most varied of all those of the vegetables of our climates. *Sebastien le Vaillant* enumerates one hundred and four species of them in the vicinity of Paris, without taking into the account the fungoids, which furnish, at least, a dozen more. Nature has dispersed them over most shady places,

where they frequently form contrasts the most extraordinary. There are some which thrive only on the naked rock, where they present a forest of small filaments, each of which supports its particular chapiter. There are some which grow on substances the most abject, with forms the most solemn; such is that which thrives on what falls from the horse, and which resembles a Roman hat, whence it has borrowed its name. Others present agreeable consonances: Such is that which grows at the foot of the alder, under the form of a cockle. What nymph has planted a shell by the root of a tree of the rivers?

This numerous tribe appears to have its destiny attached to that of the trees, which have each a mushroom appropriated to itself, and rarely to be found elsewhere; Such are those which grow only on the roots of plumb trees and pines. To no purpose does Heaven pour down its copious rains; the mushroom, under covert of its umbrella, receives not a single drop. They derive the whole support of life from the Earth, and from the potent vegetable to whose fortune they have united their own: Like those little Savoyards, who are planted as posts at the gates of the hotels of the Great, they extract their subsistence out of the superfluity of another; they grow under the shade of the Powers of the forest, and live on the superabundance of their sumptuous banquets.

Other vegetables present oppositions of strength to weakness in a different way, and consonances of protection still more distinguished. Those which we have been mentioning, like lordly Chieftains, leave their humble friends at their feet: The others carry them in their arms, and place them upon their heads. They frequently receive the recompense of their noble hospitality. The liannes which, in the Antilles Islands, attach themselves to the trees of the forest, defend them from the fury of the hurricane. The Gallic Oak has oftener than once seen itself an object of veneration to the Nations, from having carried the mistletoe in its branches. The ivy, a friend to

monuments and tombs; the ivy, with which, in ancient times, they crowned the Poets who conferred immortality, sometimes covers with its foliage the trunks of the stately trees. It is one, among many, of the irresistible proofs of the vegetable compensations of Nature; for I do not recollect that I ever saw the ivy on the trunks of pines, of firs, or of other trees whose foliage lasts all the year round. It invests those only which are stripped by the hand of Winter. Symbol of a generous friendship, it attaches itself only to the wretched; and when death itself has smitten its protector, it restores him again the honours of the forest where he lives no longer; it makes him revive, by decorating his shade with garlands of flowers, and festoons of undecaying verdure.

The greatest part of plants which grow under the shade, are adorned with the most vivid colours; thus the mosses display the brilliancy of their emerald green on the dusky sides of the rocks. In the forests, the mushroom and the agaricum distinguish themselves by their colours from the roots of the trees under which they grow. The ivy detaches itself from their gray barks by its shining green; the mistletoe discloses its branches of a yellowish green, and its fruits similar to pearls, amidst the thick foliage of the oak. The aquatic convolvulus dazzles you with its large white bell shaped flowers on the trunk of the willow. The virgins' bower clothes with verdure the ancient towers, and, in Autumn, her foliage of gold and purple, seems to fix, on their sober eminences, the rich colours of the setting Sun. Other plants, entirely concealed from the eye, discover themselves by their perfumes. It is thus that the obscure violet invites the hand of lovers to the bosom of the prickly shrub. And thus is verified, on every hand, that great Law of contrasts, which governs the World: No aggregation is, in plants, the effect of chance.

Nature has established, in the numerous tribes of the vegetable kingdom, a multitude of alliances, the end of

which is unknown to us. There are plants, for example, the sexes of which are on different individuals, as in the animal Creation. There are others whom you always find united in several clusters, as if they loved to live in society; others, on the contrary, you almost always meet with in a state of solitude. I presume, that many of these relations are connected with the character of the birds which live on their fruits, and which resow them. The herbage in the meadows frequently represent the bearing of the trees in the forests; there are some which, in their foliage and proportions, resemble the pine, the fir, and the oak: Nay, I believe that every tree has a consonance in its corresponding herb. It is by a magic of this sort, that small spots of ground present to us the extent of a large district. If you are under a grove of oaks, and perceive, on an adjoining hillock, tufts of germander, the foliage of which resembles them in miniature, and you will feel all the effect of a perspective. These diminutions of proportion extend from trees even down to mosses, and are the causes, in part, of the pleasure which we enjoy in wild rural scenes, where Nature has had leisure to dispose and accomplish her plans. The effect of those vegetable illusions is so undoubtedly certain, that if you have the ground cleared, the extent of any particular spot, when stripped of its natural vegetables, appears much smaller than before.

Nature farther employs diminishing shades of verdure, which, being lighter on the summit of trees than at their base, gives them the appearance of being more lofty than they really are. She appropriates, besides, the pyramidical form to many mountain trees, in order to increase the apparent elevation of their site; this is observable in the larch, the fir, the cypress, and in many other plants, which grow on heights. She sometimes unites, in the same place, the effects of seasons and of climates the most opposite. She clothes, in hot climates, the whole sides of mountains with the vegetable called the ice plant, because

it seems entirely covered over with flakes of ice; you would believe that, in the midst of Summer, *Boreas* had breathed upon it all the chilling blasts of the North.

On the other hand, we find, in Russia, mosses in the midst of Winter; which, from the red and smoky colour of their flowers, have the appearance of being set on fire. In our rainy climates, she crowns the summits of hillocks with broom and rosemary; and the tops of ancient towers with the yellow gilliflower: In the midst of the gloomiest day, you would imagine you saw the rays of the Sun shining upon them.

In another place, she produces the effect of the wind in the midst of perfect stillness. In many parts of America, a bird has only to alight on a tuft of the sensitive plant, in order to put in motion the whole stripe, which sometimes extends to three furlongs. The European traveller stands still, and observes, with astonishment, the air tranquil, but the herbage in motion. I myself have sometimes mistaken, in our own woods, the murmur of poplars and of aspens, for the bubbling of brooks. Oftener than once, seated under their shade, on the skirt of a meadow, whose herbage the winds put into an undulatory motion, this multiplied tremulousness has transfused into my blood the imaginary coolness of the stream.

Nature frequently employs the ærial vapours, in order to give a greater extent to our landscapes. She diffuses them over the cavities of valleys, and stops them at the windings of rivers, giving you a glimpse, at intervals, of their long canals, illuminated by the Sun. She thus multiplies their plans, and prolongs their extent. She sometimes withdraws this magic veil from the bottom of the valleys, and rolling it over the adjacent mountains, on which she tinges it with vermillion and azure, she confounds the circumference of the Earth with the vault of Heaven. It is thus, that she employs clouds as evanescent as the illusions of human life, to raise us to Heaven; it is thus that she expands over her most profound

mysteries, the ineffable sensations of infinity, and that she withdraws from our senses the perception of her Works, in order to convey to our minds a more impressive feeling of them.

ANIMAL HARMONIES OF PLANTS.

Nature, after having established on a soil formed of fragments, insensible and lifeless, vegetables endowed with principles of life, of growth and generation, accommodated to these beings which had, together with these same faculties, the power of self motion, dispositions to inhabit them, passions to derive their nourishment from them, and an instinct which impels them to make a proper choice: These are animals. I shall here speak only of the most common relations which they have with plants; but were I to attempt a detail of those which their innumerable tribes have with the elements, with each other, and with Man, whatever might be my ignorance, I should disclose a multitude of scenes still more worthy of admiration.

In an order entirely new, Nature has not changed her Laws: She has established the same harmonies and the same contrasts, of animals to plants, as of plants to the elements. It would appear natural to our feeble reason, and consonant to the great principles of our Sciences, which ascribe so much power to analogies, and to physical causes, that so many sensible beings which are produced in the midst of verdure, should be, in process of time, affected by it. The impressions of their parents, added to those of their own infancy, which serve to explain so many appearances in the human species, acquiring, in them, increasing strength, from generation to generation, by new tints, ought, at length, to exhibit oxen and sheep as green as the grass on which they pasture. We

have observed, in the preceding Study, that as vegetables were detached from the ground by means of their green colour, the animals which live on verdure distinguish themselves from it, in their turn, by means of their dusky colours; and those which live on the dusky barks of trees, or of other dark grounds, are invested with colours brilliant, and sometimes green.

On this subject, I have to remark, that many species of the birds of India, which live amidst the foliage of trees, as the greatest part of paroquets, many of the colibri, and even of turtles, are of the finest green; but independently of the white, blue, and red marbled spots, which distinguish their different tribes, and render them perceptible at a distance upon the trees, the brilliant verdure of their plumage detaches them, to great advantage, from the solemn and imbrowned verdure of those southern forests. We have seen that Nature employs this as the general means of diminishing the reflexes of the heat; but, that she might not confound the objects of her picture, if she has darkened the ground of her scene, she has bestowed greater brilliancy on the dresses of the actors.

It would appear that Nature has appropriated the species of animals coloured, in the most agreeable manner, to the species of vegetables, whose flowers are the least vivid, as a compensation. There are much fewer brilliant flowers between the Tropics, than in the temperate Zones; and, as a compensation, the insects, the birds, and even the quadrupeds, such as several species of monkeys and lizards, are there arrayed in the most lively colours. When they rest on their proper vegetable, they form with them the most beautiful contrasts, and the most lovely harmonies. I have often stood still, in the Westindies, to contemplate the little lizards, which live on the branches of trees, employing themselves in catching flies. They are of a beautiful apple green, and have on their back a sort of characters of the most vivid red, resembling the letters of the Arabian alphabet. When a cocoa tree had

several of them dispersed along its stem, never was there Egyptian Pyramid of porphyry, with its hieroglyphics, so mysterious and so magnificent, in my eyes.*

I have, likewise, seen flocks of small birds, denominated *cardinals*, because they are red all over, settle on shrubbery, the verdure of which was blackened by the Sun, and present the appearance of girandoles fludded with little burning lamps. Father *du Tertre* says, that there is not, in the Antilles, a spectacle more brilliant, than the alighting of coveys of the parrot species, called *arras*, on the summit of a palm tree. The blue, the red and the yellow of their plumage, covers the boughs of the flowerless tree, with the most superb enamel. Harmonies somewhat similar may be seen in our own climates. The goldfinch, with his red head, and wings tipped with yellow, appears, at a distance, on a bush, like the flower of the thistle in which he was hatched. You would sometimes take the slate coloured wagtail, when perched on the extremity of the leaves of a reed, for the flower of the iris.

It would be a very great curiosity to collect a great number of these oppositions, and of those analogies. They would lead us to a discovery of the plant, which is peculiarly adapted to each animal. Naturalists have paid to those adaptations no great degree of attention; such of them as have written the History of Birds, have classed them according to the feet, the bill, the nostrils. They sometimes speak of the seasons of their appearance, but scarcely ever of the trees which they frequent. Those only who, employed in making collections of butterflies, are frequently under the necessity of looking for them in their state of nymph, or caterpillar, have sometimes distinguished those insects by the names of the vegetables on

* They have sometimes served me to explain the moral sense of hieroglyphics, engraven on the obelisks of Egypt, in honour of her conquering heroes. On beholding the characters traced upon them from right to left, with heads, beaks and paws, they brought to my recollection the little fly catchers of my palm trees.

which they found them. Such are the caterpillars of the tithymale, of the pine, of the elm, and so on, which they discovered to be peculiarly appropriated to these vegetables. But there is not an animal existing but what may be referred to its own particular corresponding plant.

We have divided plants into aërial, aquatic and terrestrial, as animals themselves are divisible, and we have found, in the two extreme classes, unvarying harmonies with their elements. They may be farther divided into two classes, into trees and herbs, as animals likewise are into volatile and quadrupeds. Nature does not associate the two kingdoms in consonances, but in contrasts; that is, she does not attach the great animals to the great vegetables; but unites them contrariwise, by associating the class of trees with that of the small animals, and that of herbs with the great quadrupeds: And by means of these oppositions, she bestows adaptations of protection to the feeble, and of accommodation to the powerful.

This Law is so general, that I have remarked, in every country, where there is no great variety in the species of grasses, those of the quadrupeds which live upon them are but few in number; and that wherever the species of trees are multiplied, those of volatile are likewise so. The truth of this may be ascertained by consulting the herbals of many parts of America, and, among others, those of Guyana and of Brasil, which present but few varieties in the grasses, but a great number in the trees. It is well known that those countries have, in fact, few quadrupeds natural to them, and that they are peopled, on the contrary, with an infinite variety of birds and insects.

If we cast a glance on the relations of grasses to quadrupeds, we shall find that, notwithstanding their apparent contrasts, there is actually between them a multitude of real correspondencies. The small elevation of the gramineous plants places them within the reach of the jaws of quadrupeds, whose head is in a horizontal position, and frequently inclined toward the ground. Their delicate

shoots seem formed to be laid hold of by broad and fleshy lips; their tender stems, easily snapped by the incisive teeth; their mealy seeds easily bruised by the grinders. Besides, their bushy tufts, and elastic without being ligneous, present soft litter to ponderous bodies.

If, on the contrary, we examine the correspondencies which exist between trees and birds, we shall find that the branches of trees may be easily clasped by the four toed feet of most birds, which Nature has disposed in such a manner, that by means of three before and one behind, they may be able to grasp the bough as with a hand. Again, the birds find, in the different tiers of the foliage, a shelter against the rain, the Sun, and the cold, toward which the thickness of the trunks farther contribute. The apertures formed in these, and the mosses which grow upon them, furnish situations for building their nests, and materials for lining them. The round or oblong seeds of trees are accommodated to the form of their bills. Such as bear fleshy fruits are resorted to by birds, which have beaks pointed, or crooked, like a pick axe.

In the islands of the regions situated between the Tropics, and along the banks of the great rivers of America, the greatest part of maritime and fluviatic trees, among others, many species of the palm tree, bear fruits enclosed in very hard shells, whereby they are enabled to float on the face of the waters, which resow them at a great distance; but their covering does not secure them from the attack of the birds. The different tribes of paroquets which have made them their habitation, and of which I have reason to believe that there is a species appropriated to each species of palm tree, easily find means to open their hard cases with hooked bills, which pierce like an awl, and hold fast like pincers.

Nature has, farther, accommodated animals of a third order, which find in the bark, or in the flower of a plant, as many conveniencies as the quadruped has in a meadow, or the bird in the whole tree: I mean the insects.

Certain naturalists have divided them into six great tribes, which they have characterized, according to custom, but to very little purpose, by Greek names. They class them into *coléopterous*, or cased, insects; as the scarab tribe, such are our maybugs, or chafers: Into *hémipterous*, or half cased, as the gallinsects, such is the kermés: Into *tétrapterous farinaceous*, or four mealy winged, as butterflies; into *tétrapterous*, without any addition, or four naked winged, as bees; into *dipterous*, or two winged, as the common fly; and into *apterous*, or wingless, as the ant. But these six classes admit of a multitude of divisions and of subdivisions, which unite species of insects, of forms and instincts the most dissimilar; and separate a great many others of them which have otherwise a very striking analogy among themselves.

Whatever may be in this, the order of animals in question appears to be particularly attributed to trees. *Pliny* observes that ants are singularly fond of the grains of the cypress. He tells us, that they attack the cones which contain them, on their half opening as they arrive at maturity, and plunder them to their very last seed; and he considers it as a miracle of Nature, that an insect so diminutive should destroy the seed of one of the largest trees in the World. I believe we never shall be able to establish, in the different tribes of insects, a real order, and in the study of them, that pleasure and utility of which it is susceptible, but by referring them to the different parts of vegetables. Thus we might refer to the nectars of the flowers, the butterflies and flies which are furnished with a proboscis for sipping up their juices; to their stamina, those flies which, like the bee, have spoon mouths scooped out in their thighs, lined with hair, for collecting their powder, and four wings to assist them in carrying off their booty; to the leaves of plants, the common flies and the gallinsects, which have pointed and hollow prongs for making incisions in them, and for drinking up their fluids; to the grains, the scarab race, as the weevil, which

is designed to force its way into the heart of the seed to feed upon its meal, and which is provided with wings, inclosed in cases, to prevent their being injured, and with a file to open for itself a passage; to the stem, those worms which are quite naked, because they have no need of being clothed in a substance of wood, which shelters them on every side, but they are furnished with augers, by the help of which they sometimes go nigh to destroy whole forests; finally, to the wreck of every sort, the ants which come armed with pincers, and with an instinct of advancing in bands to cut to pieces, and to carry off every thing that suits their purpose.

The desert of this vast vegetable banquet is hurled down by the rainy torrents to the rivers, and thence to the Sea, where it presents a new order of relation with the fishes. It is worthy of remark, that the most attractive baits which can be presented to them, are deduced from the vegetable kingdom, and particularly from the grains, or from the substances of the plants, which have the aquatic characters which we have indicated, such as the hard shell of the Levant, the rush of Smyrna, the juice of the tithymal, the Celtic spikenard, the cummin, the anise, the nettle, the sweet marjoram, the root of the birthwort, and the seed of the hemp. Thus, the relations of these plants with fishes confirm what has been said of those of their grains with the waters.

By referring the different tribes of insects to the different parts of plants, and in that way only, can we discern the reasons for which Nature has been determined to bestow on those diminutive animals figures so extraordinary. We should then know the uses of their utensils, of which the greater part is hitherto unknown; and we should have continually new occasion to admire the Divine Intelligence, and to perfect our own. On the other hand, such progress in knowledge would diffuse the clearest light over many parts of plants, the utility of which is a world

unknown to Botanists, because they have consonances only with animals.

I am persuaded, that there is not a single vegetable but what has connected with it, at least, one individual of each of the six general classes of insects, acknowledged by Naturalists. As Nature has divided each genus of plants into different species, in order to render them capable of growing in different situations; she has, in like manner, divided each genus of insects into different species, in order to adapt them to inhabit different species of plants. For this reason she has painted, and numbered, in a thousand different, but invariable ways, the almost infinite divisions of the same branch. For example, we constantly find on the elm the beautiful butterfly, called the gold brocade, on account of its rich colouring. That which goes by the name of the four omicrons, and which lives I know not where, always produces descendants impressed with that Greek character, four times, on their wings. There is a species of bee with five claws, which lives on radiated flowers only; without those claws, she could not cling fast to the plane mirrors of those flowers, and load herself from their stamina, so easily as the common bee, which usually labours at the bottom of those which have a deep corolla.

Not that I imagine any one plant nourished, in its different varieties, all the collateral branches of one family of insects. I believe that each genus of these extends much farther than the genus of plants which serves as its principal basis. In this, Nature manifests another of her Laws, by virtue of which she has rendered that the best which is the most common. As the animal is of a nature superior to the vegetable, the species of the first are more multiplied, and more generally diffused than those of the second. For example, there are not so many as sixteen hundred species of plants in the vicinity of Paris; but within the same compass there are enumerated near six thousand species of flies. This leads me to presume,

therefore, that the different tribes of plants cross with those of animals, which renders their species susceptible of different harmonies. Of this a judgment may be formed from the variety of tastes, in birds of the same family. The black headed yellow hammer nestles in the ivy; the red headed in walls, in the neighbourhood of hemp fields; the brown yellow hammer builds on trees by the highway's side, where she finishes off her nest with horse hair. A dozen species of that bird are enumerated in our climates, each of which has its particular department. Our different sorts of larks are likewise apportioned to different situations; to the woods, to the meadows, to the heaths, to arable lands, and to the shores of the Sea.

Very interesting observations may be made respecting the duration of vegetables, which are unequal, though subjugated to the influences of the same elements. The oak serves as a monument to the nations: and the *nostrum*, which grows at his foot, lives only a single day. All I shall say upon this head, in general, is, that the period of their decay is by no means regulated in conformity to that of their growth; neither is that of their fecundity proportioned to their weakness, to climates, or to seasons, as some have pretended. *Pliny** quotes instances of holmes, of plane trees, and of cypresses, which existed in his time, and which were more ancient than Rome, that is, more than seven hundred years old. He farther tells us, that there were still to be seen near Troy, around the tomb of Ilius, oaks which had been there from the time that Troy took the name of Ilium, which carries us back to an antiquity much more remote.

I have seen, in Lower Normandy, in a village church yard, an aged yew, planted in the time of *William* the Conqueror; it is still crowned with verdure, though its trunk cavernous, and through and through pervious to the day, resembles the staves of an old cask. Nay, there

* Natural History, book xvi. chap. 44.

are bushes which seem to have immortality conferred upon them. We find, in many parts of the kingdom, hawthorns, which the devotion of the Commonalty has consecrated by images of the Virgin, and which have lasted for several ages, as may be ascertained by the inscriptions upon the chapels which have been reared in the vicinity.

But, in general, Nature has proportioned the duration and the fecundity of plants to the demands of animal life. A great many plants expire as soon as they have yielded their seed, which they commit to the winds. There are some, such as mushrooms, whose existence is limited to a few days, as the species of flies which feed upon them. Others retain their seeds all the Winter through, for the use of the birds; such are the fruits of most shrubs.

The fecundity of plants is by no means regulated according to their size; but proportionally to the fecundity of the animal species which is to feed upon them. The pannic, and the small millet, and some other gramineous plants, so useful to man and beast, produce incomparably more grains than many plants, both greater and smaller than themselves. There are many herbs which perpetuate themselves, by their seeds, only once a year; but the chickweed renovates itself by its seeds, up to seven or eight times, without being interrupted in the process even by Winter. It produces ripe seeds within six weeks from the time of its being sown. The capsule, which contains them, then inverts itself, turning toward the earth and half opens, to leave them at liberty to be carried away by the winds, and the rains, which sow them again every where. This plant ensures, the whole year through, the subsistence of the small birds of our climates. Thus, Providence is so much the more powerful, as the creature is more feeble.

Other plants have relations to animals the more tenderly affecting, in proportion as climates and seasons seem to exercise over the animal the greater degree of severity. Were we enabled to investigate these adaptations to the

bottom, they would explain all the varieties of vegetation, in every latitude, and in every season. Wherefore, for example, do most of the trees of the North shed their leaves in Winter; and wherefore do those of the South retain theirs all the year round? Wherefore, in defiance of the Winter's cold in the North, do the firs there continue always clothed with verdure? It is a matter of no small difficulty to discover the cause of this; but the end is obviously discernible. If the birch and the larch of the North drop their foliage, on the approach of Winter, it is to furnish litter to the beasts of the forest; and if the pyramidal fir there retains its leaves, it is to afford them shelter amidst the snows. This tree then presents to the birds the mosses which are suspended on its branches, and its cones replenished with ripe kernels. In their vicinity, oft times, thickets of the service tree display for their use the shining clusters of their scarlet berries.

In the Winters of our climates, many evergreen shrubs, as the ivy, the privet and others, which remain loaded with black or red fruit, contrasting strikingly with the snow, as the prime print, the thorn and the eglantine, present to the winged creation both a habitation and food. In the countries of the Torrid Zone, the earth is clothed with fresh liannes, and shaded with trees of a broad foliage, under which animals find a cool retreat. The trees themselves, of those climates, seem afraid of exposing their fruits to the burning heat of the Sun: Instead of rearing them as a cone, or exhibiting them on the circumference of their heads, they frequently conceal them under a thick foliage, and bear them attached to their trunks, or at the sprouting of their branches: Such are the *jacquier*, the banana, the palm tree of every species, the *papayer*, and a multitude of others. If their fruits invite not the animals externally, by vivid colours, they call them by the noise which they excite. The lumpish cocoanut, as it falls from the height of the tree which bears it, makes the earth resound to a considerable distance. The black pods of

the *canneficier*, when ripe, and agitated by the wind, produce, as they clafh against each other, a found refembling the tic tac of a mill. When the grayish fruit of the genipa of the Antilles comes to maturity, and falls from the tree, it bounces on the ground with a noife like the report of a piftol.* Upon this fignal, more than one gueft, no doubt, reforts thither in queft of a repaft. This fruit feems particularly deftined to the ufe of the land crabs, which are eagerly fond of it, and very foon grow fat on this kind of food. It would have answered no purpofe to them to fee it on the tree, which they are incapable of climbing; but they are informed of the moment when it is proper for food, by the noife of its fall.

Other fruits, as the jaque and mango, affect the fenfe of fmelling in animals fo powerfully, as to be perceptible more than the quarter of a league diftant, when the fruit is to windward. I believe that this property, of emitting a powerful perfume, is likewise common to fuch of our fruits as lie concealed under the foliage, apricots, for inftance. There are other vegetables which manifefthemfelves to animals, if I may ufe that expreffion, only in the night time. The jalap of Peru, or the belle of the night, opens not her ftrongly fcented flowers except in the dark. The flower of the nafturtium, or nun, which is a native of the fame country, emits, in the dark, a phofphoric light, obferved, for the firft time, in Europe, by a daughter of the celebrated *Linnaeus*.

The properties of thefe plants convey a happy idea of thofe delightful climates, in which the nights are fufficiently calm, and fufficiently luminous to difclofe a new order of fociety among animals. Nay, there are infts which ftand in no need of any pharos to affift them in fteering their nocturnal courfes. They carry their lanterns about them; fuch are the fpecies of luminous flies. They fcatter themfelves, fometimes, in the groves of or-

* Father *de Tertre's* History of the Antilles.

ange trees, of papayas, and other fruit trees, in the midst of the darkest night. They dart, at once, by several reiterated beatings of their wings, a dozen of fiery streams, which illuminate the foliage and fruits of the trees whereon they settle, with a golden and bluish light;* then, all at once repressing their motion, they plunge again into obscurity. They alternately resume and intermit this sport during the whole night. Sometimes there are detached from them swarms of brilliant sparks of light, which rise into the air, like the emanations of a firework.

Were we to study the relations which plants have to animals, we should perceive in them the use of many of the parts, which are frequently considered as productions of the caprice, and of the confusion, of Nature. So widely extended are those relations, that it may be confidently affirmed, that there is not a down upon a plant, not an intertexture of a shrub, not a cavity, not a colour of leaf, not a prickle, but what has its utility. Those wonderful harmonies are especially to be remarked, with relation to the lodgings and the nests of animals. If, in hot countries, there are plants loaded with down, it is because there are moths, entirely naked, which clip off their fleece, and weave it into clothing. There is found, on the banks of the Amazon, a species of reed, from twentyfive to thirty feet high, the summit of which is terminated by a large ball of earth. This ball is the workmanship of the ants, which retire thither at the time of the rains, and of the periodical inundations of that river: They go up, and descend along the cavity of this reed, and live on the refuse which is then swimming around them on the surface of the water.

It is, I presume, for the purpose of furnishing similar retreats to many small insects, that Nature has hollowed the stems of most of our plants of the shore. The valif-

* Consult the same Work of *du Tertre*.

neria,* which grows in the stream of the Rhone, and carries its flower on a spiral stem, capable of being drawn out in proportion to the rapidity of the sudden swellings of that river, has holes pierced through at the basis of its leaves, the use of which is much more extraordinary. If you take up this plant by the root, and put it into a large vessel full of water, you perceive, at the basis of its leaves, masses of a bluish jelly, which insensibly lengthen into pyramids of a beautiful red. These pyramids presently furrow themselves into flutings, which disengage from the summit, invert themselves all around, and present, by their expansion, very beautiful flowers formed of rays purple, yellow and blue. By little and little, each of these flowers advances out of the cavity in which it is partly contained, and withdraws to some distance from the plant, remaining, however, attached to it, by a small filament. You then perceive each of the rays of which those flowers are composed, assume a motion peculiar to itself, which communicates a circular movement to the water, and precipitates to the centre of each of them all the small bodies which are floating around. If those wonderful expansions are disturbed by any sudden shock, immediately every filament contracts, all the rays close, and all the pyramids retire into their cavities; for those pretended flowers are polypuses.

There are, in certain plants, parts which may be considered as characters of uncultivated Nature, but which are like all the rest of her Works, evident proofs of the wisdom and providence of her AUTHOR; such are the prickles. Their forms are varied without end, especially

* Consult, with regard to the Valisneria, the Voyage of an anonymous English traveller, performed in the year 1750, to France, Italy, and the Islands of the Archipelago, in four small volumes, vol. i. It is stored with judicious observations of every kind. Consult likewise, respecting the genipa, and the different fruits, plants, and animals of southern countries, the sprightly Father *du Tertre*, the patriotic Father *Charlevoix*, *John de Laet*, the Historian, and all travellers who have written on the subject of Nature, without the spirit of system, assisted by the light of reason alone.

in hot countries. Some are shaped like saws, like hooks, like needles, like the head of a halberd, and like caltrops. Some of them are round like awls, some triangular, like the shoemaker's piercer, and some flattened like a lancet. There is no less variety in their aggregations. Some are arranged on the leaves in balls, like those of the opuntia; others in stripes, like those of the Peruvian taper. Some are invisible, as those of the shrub of the Antilles, known by the name of captain's wood. The leaves of this formidable plant, appear, on the upper side, smooth and shining; but they are covered, on the under side, with very delicate prickles, which are inserted in such a manner, that, apply your hand to them ever so cautiously, it is impossible to avoid pricking your fingers.

There are other thorns planted only on the stems of plants, others are on their branches. In our climates, they are scarcely ever to be found, except on shrubbery, and on a few trees; but in both Indies, they are scattered over a great many species of trees. Their very various forms and dispositions have relations, of which the greatest part are to us unknown, to the security and defence of the birds which live upon them. It was necessary that many of the trees of those countries should be armed with thorns, because many quadrupeds are there to be found, capable of climbing them, to eat the eggs and the young of birds, such as the monkey, the civet cat, the tyger, the wild cat, the musk rat, the opossum, the wild rat and even the common rat.

The Asiatic acacia* presents to its winged inhabitants a retreat absolutely inaccessible to their enemies. It bears

* There is a plant of the Asiatic acacia to be seen in that beautiful garden adjacent to the iron gate of Chaillot, which formerly belonged to the virtuous Chevalier de *Gensin*. As to the name of *false acacia*, given to the acacia of America, I must observe, that Nature produces nothing false. She has given varieties of all her productions, in all Countries, in order to bestow upon them relations adapted to the elements and to animals; and when we do not find in these the characters which we have assigned to them, the charge of falshood is not, in justice, to be fixed on her Works, but on our systems.

no prickles on its trunk, and in its branches ; but at the height of ten or twelve feet, precisely at the place where the tree begins to branch off, there is a belt of several rows of large thorns, from ten to twelve inches in length, presenting an impenetrable rampart of spikes, nearly resembling the iron head of a halberd. The collar of the tree is encircled by it in such a manner, that it is impossible for any quadruped to get up. The acacia of America, improperly called the false acacia, has its prickles formed into hooks, and scattered over its branches, undoubtedly from some unknown relation of opposition to the species of quadruped which makes war on the bird that inhabits it.

There are, in the Antilles Islands, trees which have no thorny prickles, but which are much more ingeniously protected than if they had. A plant known in those countries by the name of the prickly thistle, which is a species of creeping taper, attaches its roots, similar to filaments, to the trunk of one of those trees, and runs to the ground all around it, to a considerable distance, crossing its branches one over another, and forming an inclosure of them, which no quadruped dares to approach. It likewise produces a fruit very grateful to the palate. On beholding a tree, the foliage of which is harmless, filled with birds that have there fixed their habitation, surrounded about the roots by one of those prickly thistles, and you are presented with the idea of one of those commercial defenceless cities, apparently accessible on every side, but protected all around by a citadel, encompassing it with extended intrenchments. Thus the tree is on one side, and its thorn on the other.

Quadrupeds, which live on the eggs of birds, would be reduced to great distress, did not Nature sometimes produce, on the summits of those very trees, a vegetable of very extraordinary form, which opens a passage to them. It is, in every respect, the opposite of the prickly thistle. It is a root of two feet in length, as thick as a man's leg,

pricked, as if pierced with a bodkin, and adhering to a branch of the tree, by a multitude of filaments, somewhat in the same way that the prickly thistle is affixed to the under part of its trunk. Like the other, it derives its nourishment from the tree, and emits from ten to twelve great leaves, in form of a heart, of about three feet in length, and two feet in breadth, resembling the leaves of the nymphæa. Father *du Tertre* calls it the false root of China. What is still more extraordinary, it lets fall, from the top of the tree on which it is placed, in a perpendicular direction, very strong cordage, of the size of a quill, the whole length through, which takes root on reaching the ground. The plant itself emits no smell, but this cordage smells strongly of garlic. Undoubtedly, when a monkey, or some such clambering animal, perceives this broad standard of verdure, to no purpose does the tree oppose, around its root, a fortification of thorns, this signal announces that he has a friend within the fortrefs: The smell of the cordage, which descends down to the ground, directs him to the scaling ladder, even during the night; and while the birds are sleeping in security on their nests, confident in the strength of their bulwarks, the enemy gets possession of the town through the suburbs.

In those countries, the thorns upon the trees afford protection even to the insects. Bees there carry on their honey making processes in the aged trunks of prickly trees, hollowed by the hand of Time. It is very remarkable that Nature, who has provided this resource for the bees of America, has withheld from them a sting, as if those on the trees were sufficient for their defence. I believe that to this reason it may be ascribed, though no attention has been paid to it, that we have never hitherto been able to rear in the Antilles Islands, the honey bees of the country. They refused, no doubt, to take up their abode in domestic hives, because they did not consider themselves as there in a state of security; but might, per-

haps, have been induced to make that choice, had the hives, to which they were invited, been decorated and defended by thorns.

If Nature employs prickly vegetables for the defence even of flies against the attacks of quadrupeds, she sometimes makes use of the same means for delivering quadrupeds from the persecution of common flies. She has, in truth, bestowed on those which are the most exposed to it, manes and tails, armed with long hair, to drive them away; but the multiplication of those insects is so rapid in warm and humid seasons and countries, as to threaten destruction to the whole race of animals. One of the vegetable barriers, opposed to them by Nature, is the *dionæa muscipula*. This plant bears on one and the same branch, opposite little leaves, besmeared with a sugary liquor, resembling manna, and studded with very sharp prickles. When a fly perches on one of those little leaves, they instantly close with a spring, like the jaws of a wolf trap, and the fly is spitted through and through.

There is another species of the *dionæa* which catches those insects with its flower. When the fly attempts to extract its nectareous juices, the corolla, which is tubulous, shuts at the collar, seizes the insect by the proboscis, and thus puts it to death. This plant is cultivated in the Royal Garden. It is observable, that its cup formed flower is white, radiated with red, and that these two colours universally attract flies, from their natural avidity of milk and of blood.

There are aquatic plants, armed with thorns, proper for catching fishes. You may see in the Royal Garden, an American plant, called *martinia*, the flower of which has a very agreeable odour, and which, from the form of its rounded leaves, the sleekness of their tails and of their stems, has all the aquatic characters which have been indicated. It has this farther character peculiar to itself, that it transpires so copiously as to appear to the touch in a state of continual humidity. I can have no doubt, there-

fore, that this plant grows in America on the brink of the water. But the shell which envelops its seeds possesses a very extraordinary nautical character. It resembles a fish half dried, white and black, with a long fin upon the back. The tail of this fish is drawn out into great length, and terminates in a very sharp point, bent into the form of a fish hook. This tail usually separates into two, and thus presents a double hook. The configuration of this vegetable fish is completely similar in size, and in form, to the hook which is employed at sea for catching goldneys, and at the head of which is figured, in linen, a flying fish, with this exception, that the goldney hook has but one curve and barb, whereas the shell of the martinia has two, which must render its effect more infallible. This shell contains several black seeds, shrivelled, and similar to the globules of the sheep's dung flattened.

As I possess but few books on Botany, I did not know of what country the martinia was a native; but having lately consulted the Work of *Linnaeus*, I find that we got it from Vera Cruz. The celebrated Naturalist, whom I have just mentioned, discovers, in this shell, no resemblance but that of a woodcock's head; but had he ever seen the hook for goldneys, he could not possibly have hesitated about preferring this similitude, in the appearance, in as much as the extremity of this pretended beak bends back into two hooks, which prick like needles, and are, as well as the whole shell, and the tail, by which it is united to the stem, of a ligneous and horny substance, not easily broken asunder. *John de Laet* * tells us, that the land of Vera Cruz is on a level with the Sea, and that its port, called *St. John de Hulloo*, is formed by a small island, no higher than the water; so that, says he, when the tide rises very high, the land wholly disappears.

Such inundations are very common at the bottom of the Gulf of Mexico, as we learn from the relation which *Dam-*

* History of the Westindies, book v, chap. 18.

pier has given us of the Bay of Campechy, which is in that vicinity. Hence I presume, that the martinia, which grows on the inundated shores of Vera Cruz, has certain relations, which we know nothing of, to the fishes of the Sea; in as much as the seeds of several trees and plants of those countries, described by *John de Laet*, possess very curious nautical forms. A drawing of the martinia, taken from Nature, is presented fronting page 221 of this Volume.

But there is no occasion to resort to foreign plants, for ascertaining the existence of vegetable relations to animal. The brambble, which affords, in every field through which we pass, a shelter to so many birds, has its prickles formed into hooks; so that it not only prevents the cattle from disturbing the birds' retirement, but frequently lays them under contribution for a flake of wool or hair, proper for finishing off their nests, as a reprisal for hostility committed, and an indemnification for damages sustained. *Pliny* alleges, that this gave rise to the pretended animosity between the linnet and the ass. This quadruped, whose palate is proof against thorns, frequently browses on the shrub in which the linnet builds her nest. She is so terrified at his voice, that on hearing it, says he, she kicks down her eggs; and her callow brood die with terror of it. But she makes war upon him, in her turn, by fixing her attack on the scratches made in his hide by the prickles, and picking the flesh in those tender parts, to the very bone. It must be a very amusing spectacle to view the combat between the little and melodious songster, and the dull, braying, but otherwise inoffensive, animal.

Did we know the animal relations of plants, we should possess sources of intelligence respecting the instincts of the brute creation, with which we are totally unacquainted. We should know the origin of their friendships, and of their animosities, at least as to those which are formed in society; for with regard to such as are innate, I do not believe that the cause of them was ever revealed to any

man. These are of a different order, and belong to another world. How should so many animals have entered into life, under the dominion of hatred, without having been offended ; furnished with skill and industry, without having served an apprenticeship ; and directed by an instinct more infallible than experience ? How came the electrical power to be conferred on the torpedo, invisibility on the camoleon, and the light of the stars themselves on a fly ? Who taught the aquatic bug to slide along the waters, and another species of the same denomination to swim upon the back ; both the one and the other for catching their prey, which hovers along the surface ? The water spider is still more ingenious. She encloses a bubble of air in a contexture of filaments, takes her station in the middle, and plunges to the bottom of the brook, where the air bubble appears like a globule of quicksilver. There, she expatiates under the shade of the nymphæa, exempted from the dread of every foe. If, in this species, two individuals, different in sex, happen to meet, and to suit each other, the two globules, being in a state of approximation, become united into one, and the two insects are in the same atmosphere. The Romans, who constructed on the shores of *Baiæ*, saloons underneath the waves of the Sea, in order to enjoy the coolness, and the murmuring noise of the waters, during the heats of Summer, were less dexterous, and less voluptuous. If a man united in himself those marvellous faculties which are the portion of insects, he would pass for a god with his fellow creatures.

It is of importance for us to be acquainted with, at least, such insects as destroy those which are offensive to Man. We might turn their mutual hostility to good account, by converting it into the means of our own repose. The spider catches the flies in nets ; the formicaléo surprises the ants in a tunnel of sand ; the four winged ichneumon seizes the butterflies on the wing. There is another ichneumon, so small and so cunning, that it lays an egg in the

anus of the vine fretter. Man has it in his power to multiply at pleasure the families of insects which are useful to him; and may find means of diminishing such as make depredations on his agricultural possessions. The small birds of our groves tender him, to the same effect, services of still greater extent, and accompanied with other circumstances inexpressibly agreeable. They are all directed by instinct to live in his vicinity, and about the pastures and habitations of his flocks and herds. A single species of them might frequently be sufficient to protect the cattle from the insects which infest them through the Summer.

There is in the North a gadfly, called *Kourbma* by the Laplanders, and by the Learned, *æstrus rangiferinus*, which torments the domestic reindeer to such a degree as to force them in agony to the mountains, and sometimes actually plague them to death, by depositing their eggs in the skin of the animal. Many dissertations have, as the custom is, been composed on this subject, but no remedy for the evil has been proposed. I am convinced there must be birds in Lapland, which would deliver the reindeer from this formidable insect, did not the Laplanders terrify them away by the noise of their fowling pieces. These arms of civilized Nations have overspread with barbarism all our plains. The birds, destined to embellish the habitation of Man, withdraw from it, or approach with timidity and mistrust. The sound of musketry ought to be prohibited, at least, around the haunts of the harmless cattle. When the birds are not scared away by the fowler, they follow their instincts.

I have frequently seen in the Isle of France, a species of starling, called martin, imported thither from India, perch familiarly on the back and horns of the oxen, to pick them clean. To this bird that island stands indebted, at the present day, for the destruction of the locusts, which, in former times, committed such ravages upon it. In those of our European rural scenes which still exhibit,

on the part of Man, some degree of hospitality toward the innocent warblers, he has the pleasure of seeing the stork build her nest on the ridge of his house; the swallow flutter about in his apartments: And the wagtail, along the bank of the river, frisk around his sheep, to protect them from the gnats.

The foundation of all this variety of pleasant and useful knowledge is laid in the study of plants. Each of them is the focus of the life of animals, the species of which there collect in a point, as the rays of a circle at their centre.

As soon as the Sun, arrived in his annual progression, at the sign of the Ram, has given the signal of Spring to our Hemisphere, the rainy and warm wind of the South takes its departure from Africa, swells the Seas, elevates the rivers above their banks, so that they inundate the adjacent plains, and fatten them with their fertilizing slime; and levels, in the forests, the aged trees, the decayed trunks, and every thing that presents an obstacle to future vegetation. It melts the snows which cover our fields, and forcing its way to the very Pole, it breaks to pieces, and dissolves the enormous masses of ice which Winter had there accumulated. When this revolution, known all over the Globe by the name of the equinoctial gale, has taken place, in the month of March, the Sun revolves night and day around our Pole, so that there is not a single point, in the whole northern Hemisphere, that can escape his heat.

Every step he advances in his course through the Heavens, a new plant makes its appearance on the Earth. Each of them arises in succession, and occupies its proper station at the hour assigned to it; at one and the same instant it receives the light in its flowers, and the dew of Heaven on its foliage. In proportion to its progress in growth, the different insect tribes which thence derive their nourishment, likewise display their existence, and unfold their characters. At this epocha, too, each species of bird re-

sorts to the species of plant with which she is acquainted, there to build her nest, and to feed her young with the animal prey which it presents to her, to supply the want of the seeds which it has not as yet produced. We presently behold the tribes of birds of passage flock thither, in quest of the portion which Nature has provided for them likewise. First comes the swallow, to preserve our habitations from the vermin, by planting her nest around us. The quail forsakes Africa, and grazing the billows of the Mediterranean, and in troops innumerable, is scattered over the boundless meadows of the Ukraine. The heathcock pursues his course northward as far as Lapland. The wild ducks and geese, the silvery swans, forming long triangular squadrons in the air, advance to the very islands adjacent to the Pole. The stork, in former times adored in Egypt, which she abandons, crosses over Europe, halting here and there to take repose, even in great cities, on the roofs of the houses of hospitable Germany. All these birds feed their young on the insects and reptiles which the newly expanded plants have fostered into life.

Then, too, it is that the fishes issue in legions, from the northern abysses of the Ocean, allured to the mouths of rivers by clouds of insects, which are confined entirely to their waters, or expand into life along their banks. They stem the watery current in shoals, and advance, skipping and springing, up to the very sources of the stream; others, as the northcapers, suffer themselves to be swept into the general current of the Atlantic Ocean, and appear, in form of a ship's bottom, on the coasts of Brasil, and on those of Guinea.

Quadrupeds themselves, likewise, then undertake long peregrinations. Some proceed from the South to the North, with the Sun; others from East to West. There are some which coast along the rugged chains of mountains; others follow the courses of rivers which have never been navigated. Lengthened columns of black cat-

the pasture, in America, along the banks of the Méchaf-sipi,* which they cause to resound with their bellowing. Numerous squadrons of horses traverse the rivers and the deserts of Tartary; and wild sheep stray bleating amidst its vast solitudes. These flocks have neither overseer nor shepherd to guide them through the desert, to the music of the pipe; but the expansion of herbage which they know, determines the moment of their departure, and the limits of their progress. It is then that each animal inhabits his natural situation, and reposes under the shade of the vegetable of his fathers. It is then that the chains of harmony exert all their force, and that all, being animated by consonances, or by contrasts, the air, the waters, the forests, and the rocks, seem to be vocal, to be impassioned, to be transported with delight.

But this vast concert can be comprehended by celestial Intelligences only. To Man it is sufficient, in order to study Nature with advantage, that he limit his researches to the study of one single vegetable. It would be necessary, for this purpose, to make choice of an aged tree, in some solitary situation. From the characters which have been indicated, a judgment might easily be formed, whether it be in its natural position; but still better from its beauty, and from the accessories which Nature uniformly places in connexion with it, where the hand of Man has not interposed to derange the operations. The student would first observe its elementary relations, and the striking characters which distinguish the different species of the same genus, some of which grow at the sources of rivers, and others at the place of their discharge into the Ocean. He would afterwards examine its convolvuluses, its mosses, its mistletoes, its scolopendræ, the mushrooms of its roots, nay, the very grasses which grow under its shade. He would perceive, in each of its vegetables, new

* Mississippi.

elementary relations, adapted to the places which they occupy, and to the tree which sustains, or shelters them.

His attention might next be directed to the various species of animals which resort to it as a habitation, and he would presently be convinced, that, from the snail up to the squirrel, there is not a single one, but what has determinate and characteristic relations to the dependencies of its vegetation.

If the tree in question were growing in a forest, itself too of considerable antiquity, it would, most probably, have, in its vicinity, the tree which Nature designed should contrast with it in the same site, as, for example, the birch with the fir. It is farther probable, that the accessory vegetables and animals of this last, would, in like manner, form a contrast with those of the first. These two spheres of observation would mutually illuminate each other, and would diffuse the clearest light over the manners of the animals which frequent them. We should then have a complete chapter of that immense and sublime History of Nature, the alphabet of which is hitherto unknown to us.

I am fully convinced, that without fatigue, and almost without any trouble, discoveries the most curious might be made; were we to restrict our enquiries but to one single compartment, we should discover a multitude of the most enchanting harmonies. In order to enjoy some imperfect sketches of this kind, we must have recourse to travellers. Our Ornithologists, fettered by methods and system, only think of swelling their catalogue, and distinguish nothing in birds save the feet and the bill. It is not in the nests that they observe them, but in hunting, and in their pouch. They even consider the colours of their plumage as accidents. It was not by chance, however, that Nature, on the shores of Brasil, bestowed a beautiful carnation colour, with a border of black, on the extremity of the wings of the *Ouara*, a species of curlew, which inhabits the sea green foliage of the *paletuvier*.

which grows in the bosom of the waves, and bears no apparent flowers. The *savia*, another bird of the same climate, is yellow over the belly, with the rest of the plumage gray. It is about the size of a sparrow, and perches on the pepper plant, the flowers of which have no lustre, but whose grains are eaten by this bird, and resown wherever she takes her flight.

To those correspondencies must be joined such as pertain to site, which itself derives so much beauty from the overshadowing vegetable. These harmonies are detailed by Father *Francis d'Abbeville*. If credit is to be given to the History of voyages by the Abbé *Prevost*, there is, on the banks of the Senegal, a fluviatic tree, the leaves of which are thorny, and the branches pendant, in form of an arch. It serves as a habitation to birds called kurbalos, or fishers, of the size of a sparrow, variously coloured. Their bill is very long, and armed with little teeth, resembling a saw. They build a nest of the bulk of a pear, composed of earth, feathers, straw, moss, and attach it to a long thread, suspended from the extremity of the branches which project over the river, in order to secure it from the serpents and monkeys, which sometimes contrive to clamber up after them. You would take those nests, at a little distance, for the fruit of the tree: And some of those trees contain to the number of a thousand. You perceive the kurbalos fluttering incessantly along the water, and entering into their nests with a motion that dazzles the eyes.

According to Father *Charlevoix*, there grows in Virginia, on the brink of the lakes, a laurel leaved yew tree, which pushes several stems from its root, the branches of which embrace all the surrounding trees, and climb to the height of more than sixteen feet. They form, in Summer, an impenetrable shade, and in Winter a temperate retreat for the birds. Its flowers have no very striking appearance, and its fruit grows in round clusters, loaded with black grains. This yew has for its principal inhabitant,

a very beautiful kind of jay. The head of that bird is adorned with a long black crest, which it can erect at pleasure. Its back is of a deep purple. The wings are black on the inside, blue externally, and white at the extremities, with white stripes across every feather. Its tail is blue, and marked with the same stripes as the wings; and its cry is far from being disagreeable.

There are birds which lodge not upon their favourite plant, but opposite to it. Such is the colibri, which frequently nestles, in the Antilles Islands, on the straw which thatches a cottage, in order to live under the protection of Man. In our climates, the nightingale constructs his nest under covert of a bush, choosing, in preference, such situations as repeat an echo, and carefully observing to expose it to the morning sun. Having employed such precautions, he takes his station in the vicinity, against the trunk of a tree; and there, confounded with the colour of its bark, and motionless, he becomes invisible. But he presently animates the obscure retreat which he has chosen, by the divine melody of his song, and effaces all the brilliancy of plumage, by the charms of his music.

But whatever enchantment may be diffused by plants and animals over the situations which have been assigned to them by Nature, I never can consider a landscape as possessing all its beauty, unless I perceive in it, at least, one little hut. The habitation of Man confers, on every species of vegetable, a new degree of interest or of majesty. Nothing more is necessary, in many cases, than a tree, in order to characterize, in a country, the wants of a whole Nation, and the care of Providence. I love to see the family of an Arab under the date tree of the desert, and the boat of an islander of the Maldivias loaded with coconuts, under the cocoa trees of their gravelly strands. The hovel of a poor unindustrious Negro gives me pleasure, under the shade of a great gourd plant, which exhibits his complete set of household furniture. Our magnificent hotels, in great cities, are the habitations of tradesmen

merely : In the country, they are transformed into castles, palaces, temples. The long avenues which announce them confound themselves with those which form the communication of empires. This is not, in truth, what I consider as most interesting in rural scenery. To the most ostentatious exhibition of splendor, I have frequently preferred the view of a little hamlet of fishermen, built by the side of a river. With inexpressible delight have I sometimes reposed, under the shade of the willows, and of the poplars, on which were suspended the bow nets, composed of their own branches.

I shall now proceed, in my usual superficial manner, to take a rapid glance of the harmonies of plants with Man ; and, in order to introduce, at least, something of order into a subject so rich in matter, I shall farther divide those harmonies, relatively to Man himself, into *elementary*, into *vegetable*, into *animal* and into *human*, properly so called, or *alimentary*.

HUMAN HARMONIES OF PLANTS.

Elementary Harmonies of Plants relatively to Man.

If we consider the vegetable Order under the simple relations of strength and magnitude, we shall find it divided, with a sufficient degree of generality, into three great classes, namely, into herbs, into shrubs and into trees. It is to be remarked, in the first place, that herbs are of a substance pliant and soft. Had they been ligneous and hard, like the young boughs of trees, to which it might appear they ought naturally to have a resemblance, as they grow on the same soil ; the greatest part of the Earth would have been inaccessible to the foot of Man,

till the fire, or the hatchet, had cleared the way for him. It was not by chance, therefore, that so many grasses, mosses and herbs, assumed a soft and yielding texture, nor from want of nourishment, nor of the means of expansion; for some of those herbs rise to a very great height, such as the banana of India, and several ferulaceous plants of our own climates, which attain the stature of a little tree.

On the other hand, there are ligneous shrubs, which do not exceed the generality of herbs in height; but they grow, for the most part, on rugged and steep places, affording to Man the means of clambering up with facility, for they shoot out of the very clefts of the rocks. But as there are rocks which have no clefts, and which present the perpendicularity of a wall, there are likewise creeping plants which take root at their bases, and which, fixing themselves to their sides, rise in close cohesion to a height surpassing that of many of the tallest trees: Such are the ivy, the virgin vine, and a great number of the *lianne* tribe, which mantle along the rocks of southern regions.

Were the Earth covered with vegetables of this sort, it would be impossible to walk over it. It is very remarkable, that when uninhabited islands were discovered, some were found clothed with forests, as the Island of Madeira; others in which there was nothing but herbage and rushes, as the Malouine Islands, at the entrance of Magellan's Strait; others carpeted with mosses simply, such as several little isles on the coast of Spitzbergen; others, in great number, on which these several vegetables were blended; but I do not know of a single one which was found to contain only shrubbery and liannes. Nature has placed this class only on places not easily to be scaled, in order to facilitate access to Man. It may be affirmed, that no precipice presents a surface so perpendicular as to be insurmountable, with their assistance. Thus aided,

the ancient Gauls were on the point of storming the capitol.

As to trees, though they are replenished with a vegetative force, which elevates them to a very considerable height, the greater part of them do not send out their first branches but at a certain distance from the ground. So that though they form, when they have attained a certain degree of elevation, an intertexture impenetrable to the Sun, which they extend to a great distance around, they leave, however, about their roots, avenues sufficient to render them accessible, so that the forests may be traversed with ease and expedition.

Such, then, are the general dispositions of vegetables upon the Earth, relatively to the occasion which Man had to range over it. The herbage serves as a carpet to his feet; the shrubbery as a scaling ladder to his hands; and the trees are as so many parasols over his head. Nature, after having established those proportions between them, has distributed them in all the varieties of situation, by bestowing on them, abstractedly from their particular relations to the elements, and to the animal creation, qualities the best adapted to minister to the necessities of Man, and to compensate, in his favour, the inconveniences of climate.

Though this manner of studying her Works be now held in contempt by most Naturalists, to it, however, shall our researches be limited. We have just been considering plants according to their shape and size, after the manner of gardeners; we proceed farther to examine them as is done by the wood feller, the huntsman, the carpenter, the fisherman, the shepherd, the sailor, nay, the nose-gay maker. It is of small importance whether we are learned, provided we cease not to be men.

It is in the countries of the North, and on the summit of cold mountains, that the pine grows, and the fir, and the cedar, and most part of resinous trees, which shelter man from the snows by the closeness of their foliage, and

which furnish him, during the Winter season, with torches and fuel for his fire side. It is very remarkable, that the leaves of those evergreen trees are filiform, and extremely adapted, by this configuration, which possesses the farther advantage of reverberating the heat, like the hair of animals, for resistance to the impetuosity of the winds, that beat with peculiar violence on elevated situations. The Swedish Naturalists have observed, that the fattest pines are to be found on the driest and most sandy regions of Norway. The larch, which takes equal pleasure in the cold mountains, has a very resinous trunk.

Mathiola, in his useful commentary on *Dioscorides*, informs us, that there is no substance more proper than the charcoal of these trees, for promptly melting the iron minerals, in the vicinity of which they peculiarly thrive. They are, besides, loaded with mosses some species of which catch fire from the slightest spark. He relates, that being obliged, on a certain occasion, to pass the night in the lofty mountains of the Strait of Trento, where he was botanizing, he found there a great quantity of larches (*larix*) bearded all over, to use his own expression, and completely whitened with moss. The shepherds of the place, willing to amuse him, set fire to the mosses of some of those trees, which was immediately communicated with the rapidity of gunpowder touched with the match. Amidst the obscurity of the night, the flame and the sparks seemed to ascend up to the very Heavens. They diffused, as they burnt, a very agreeable perfume. He farther remarks, that the best agaricum grows upon the larch, and that the arquebusers of his time made use of it for keeping up fire, and for making matches. Thus Nature, in crowning the summit of cold and ferruginous mountains with those vast vegetable torches has placed the match in their branches, the tinder at their foot, and the steel at their roots.

To the South, on the contrary, trees present, in their foliage, fans, umbrellas, parasols. The latanier carries

each of its leaves plaited as a fan, attached to a long tail, and similar, when completely displayed, to a radiating Sun of verdure. Two of those trees are to be seen in the Royal Garden. The leaf of the banana resembles a long and broad girdle, which, undoubtedly, procured for it the name of Adam's fig tree. The magnitude of the leaves of several species of trees increases in proportion as we approach the Line. That of the cocoa tree, with double fruit, of the Sechelles Islands, is from twelve to fifteen feet long, and from seven to eight broad. A single one is sufficient to cover a numerous family. One of those leaves is, likewise, to be seen in the Royal Cabinet of Natural History. That of the talipot of the Island of Ceylon is of nearly the same size.

The interesting and unfortunate *Robert Knox*, who has given the best account of Ceylon which I am acquainted with, tells us, that one of the leaves of the talipot is capable of covering from fifteen to twenty persons. When it is dry, continues he, it is at once strong and pliant, so that you may fold and unfold it at pleasure, being naturally plaited like a fan. In this state it is not bigger than a man's arm, and extremely light. The natives cut it into triangles, though it is naturally round, and each of them carries one of those sections over his head, holding the angular part before, in his hand, to open for himself a passage through the bushes. The soldiers employ this leaf as a covering to their tents. He considers it, and with good reason, as one of the greatest blessings of Providence, in a country burnt up by the Sun, and inundated by the rains, for six months of the year.

Nature has provided, in those climates, parasols for whole villages; for the fig tree, denominated, in India, the fig tree of the Banians, a drawing of which may be seen in *Tavernier*, and in several other travellers, grows on the very burning sand of the sea shore, throwing, from the extremity of its branches, a multitude of shoots, which drop to the ground, there take root, and form, a-

round the principal trunk, a great number of covered arcades, whose shade is impervious to the rays of the Sun.

In our temperate climates, we experience a similar benevolence on the part of Nature. In the warm and thirsty season, she bestows upon us a variety of fruits, replenished with the most refreshing juices, such as cherries, peaches, melons; and, as Winter approaches, those which warm and comfort by their oils, such as the almond and the walnut. Certain Naturalists have considered even the ligneous shells of these fruits, as a preservative against the cold of the gloomy season; but these are, as we have seen, the means of floating and of navigating. Nature employs others, with which we are not acquainted, for preserving the substances of fruits, from the impressions of the air. For example, she preserves, through the whole Winter, many species of apples and pears, which have no other covering than a pellicle so very thin, that it is impossible to determine how fine it is.

Nature has placed other vegetables in humid and in dry situations, the qualities of which are inexplicable on the principles of our Physics, but which admirably harmonize with the necessities of the men who inhabit those places. Along the water side grow the plants and the trees which are the driest, the lightest, and, consequently, the best adapted to the purpose of crossing the stream. Such are reeds, which are hollow, and rushes, which are filled with an inflammable marrow. It requires but a very moderate bundle of rushes to bear the weight of a very heavy man upon the water. On the banks of the lakes of the North are produced those enormous birch trees, the bark of a single one of which is sufficient to form a large canoe. This bark is similar to leather in pliancy, and so incorruptible by humidity, that, in Russia, I have seen some of it extracted from under the earth which covered powder magazines, perfectly sound, though it had lain there from the time of *Peter the Great*.

If we may depend on the testimony of *Pliny* and of *Plutarch*, there were found at Rome, four hundred years after the death of *Numa*, the books which that great King had commanded to be deposited with his body in the tomb. The body was entirely consumed; but the books, which treated of Philosophy and Religion, were in such a state of preservation, that *Petilius*, the Pretor, undertook to read them, by command of the Senate. On the report which he made respecting their contents, they were ordered to be burnt. They were written on the bark of the birch tree. This bark consists of an accumulation of ten or twelve sheets, white and thin, like paper, the place of which it supplied to the ancients.

Nature presents to Man different trajectiles on different shores. She has planted, on the banks of the rivers of India, the bamboo, an enormous reed, which rises there sometimes to the height of sixty feet, and swells to the size of a man's thigh. The part comprehended between two of its joints is sufficient to bear a man up on the water. The Indian places himself upon it a straddle, and so crosses a river, swimming along by the motion of his feet. The Dutch Navigator, *John Hugo de Linfchotten*, an author of reputation, assures us that the crocodile never touches persons who are passing rivers in this manner, though he frequently attacks canoes, and even the boats of Europeans. *Linfchotten* ascribes the abstinence of this voracious animal to an antipathy which he has to that species of reed.

Francis Pyrard, another traveller, who has observed Nature with a careful eye, informs us, that there grows, on the shores of the Maldivia Islands, a tree called *candou*, the wood of which is so light, that it serves as cork for the fishermen.* I think I was once possessed of a log of wood of that species. It was stripped of the bark, perfectly white, of the thickness of my arm, about six feet

* See *Pyrard's Voyage to the Maldivia Islands*, page 38.

long, and so light, that I could easily lift it by my finger and thumb. In these same islands, and on the same strands, rises the cocoa tree, which there attains a higher degree of beauty than any where else in the World. Thus, the tree of all others most useful to mariners, grows on the shores of the Seas most frequented by men of that description. All the world knows that the vessel is there constructed of its timber, that its leaves are formed into sails, that the trunk serves for a mast, that the hempen substance called *caira*, which surrounds its fruit, is wrought into cordage, and when the whole is ready for sea, a cargo of cocoa nuts is the lading. It is farther remarkable, that the cocoa nut, before it comes to perfect maturity, contains a liquor which is an excellent antiscorbutic.

Is it not, then, a miracle of Nature, that this fruit, replenished with such milk, should come to perfection on the barren strand, and within the washing of the briny Deep? Nay, it is only on the brink of the Sea, that the tree which bears it arrives at its highest beauty; for few are to be seen in the interior of countries.

Nature has placed a palm tree of the same family, but of a different species, on the summit of the mountains of the same climates: It is the palmist. The stem of this tree is sometimes above a hundred feet high, is perfectly straight, and bears on its summit, all the foliage which it has, a bunch of palms, from the midst of which issues a long roll of plaited leaves, resembling the staff of a lance. This roll contains, in a sort of coriaceous sheath, leaves ready to shoot, which are very good eating before their expansion. The trunk of the palmist is woody only at the circumference, and it is so hard as to resist the edge of the best tempered hatchet. It may be cleft, with the utmost ease, from end to end, and is filled, inwardly, with a spongy substance, which may be easily separated. Thus prepared, it serves to form, for conducting waters, frequently diverted from their course by the rocks which are at the summit of mountains, tubes which are not corrupt-

ible by humidity. Thus the palm tree gives to the inhabitants of those regions the means of constructing aqueducts at the source of rivers, and ships at the place of their discharge.

Other species of trees render them the same services, in other situations. On the shores of the Antilles Islands grows the *acajou*, there called, but improperly, the cedar, on account of its incorruptibility. It arrives at such a prodigious size, that out of one log of it they make a boat capable of carrying so many as forty men.* This tree possesses another quality, which, in the judgment of the best observers, ought to render it invaluable for the marine service; namely this, that it is the only one, of those shores, which is never attacked by the sea worm, an insect so formidable to every other species of timber which floats in those seas, that it devours whole squadrons in a very little time, and, in order to preserve them, lays us under the necessity, these many years past, of sheathing their bottoms with copper. But this beautiful tree has found enemies more dreadful than the worm, in the European inhabitants of those Islands, who have almost extirpated the whole race of them.

The manner in which Providence has contrived a supply for the thirst of Man, in sultry places, is no less worthy of admiration. Nature has placed, amidst the burning sands of Africa, a plant whose leaf, twisted round like a cruet, is always filled with a large glass full of fresh water; the gullet of this cruet is shut by the extremity of the leaf itself, so as to prevent the water from evaporating. She has planted on some parched districts of the same country, a great tree, called by the Negroes *Boa*, the trunk of which, of a prodigious bulk, is naturally hollowed like a cistern. In the rainy season it receives its fill of water, which continues fresh and cool, in the greatest heats, by means of the tufted foliage which crowns

* Consult Fathers *Labat* and *Du Tertre*.

its summit. Finally, she has placed vegetable fountains on the parched rocks of the Antilles. There is commonly found there a lianne, called the water lianne, so full of sap, that if you cut a single branch of it, as much water is immediately discharged as a man can drink at a draught : It is perfectly pure and limpid.

In the swamps of the Bay of Campeachy, travellers find relief of another kind. Those swamps, on a level with the Sea, are almost entirely inundated in the rainy season, and became so parched on the return of dry weather, that many huntsmen who had happened to miss their way in the forests, with which they are covered, actually perished with thirst. The celebrated traveller *Dampier* relates, that he several times escaped this calamity, by means of a very extraordinary species of vegetation, which had been pointed out to him on the trunk of a kind of pine very common there ; it resembles a packet of leaves, piled one over another in tiers ; and on account of its form, and of the tree on which it grows, he calls it the pine apple. This apple is full of water, so that on piercing it at the basis with a knife, there immediately flows from it a good pint of very clear and wholesome water. *Father du Tertre* informs us, that he has several times found a similar refreshment in the leaves, rounded like a cornet, of a species of balizier, which grows on the sandy plains of Guadaloupe. I have been assured by many of our sportsmen, that nothing was more proper for the quenching of thirst than the leaves of the mistletoe, which grows on many trees.

Such are, in part, the precautions employed by Providence for compensating, in favour of Man, the inconveniencies of every climate ; by opposing to the qualities of the elements, contrary qualities in vegetables. I shall pursue them no farther, for I believe the subject to be inexhaustible. I am persuaded, that every Latitude, and every season, has its own, which are appropriated to it,

and that every parallel varies them in every degree of Longitude.

Vegetable Harmonies of Plants with Man.

Were we now to examine the vegetable relations of plants to Man, we should find them to be infinite in number; they are the perpetual sources of our arts, of our manufactures, of our commerce, and of our enjoyments; but, in our usual way, we shall just run over a few of their natural and direct relations, with which Man has intermingled nothing of his own.

To begin with their perfumes, Man appears to me the only being, endowed with sensibility, who is affected by these. Animals, it is granted, and especially bees and butterflies, have certain plants proper to themselves, which attract or repel them by their emanations; but these affections seem to be connected with their necessities. Man alone is sensible to the perfume and lustre of flowers, independently of all animal appetite. The dog himself, who, from his domestic habits, assumes so powerful a tincture of the manners and of the tastes of Man, appears totally insensible to that enjoyment. The impression which flowers make upon us, seems connected with some moral affection; for there are some which enliven us, whereas others dispose us to melancholy, without our being able to assign any other reasons for it than those which I have endeavoured to unfold, in examining some general Laws of Nature.

Instead of distinguishing them as yellow, red, blue, violet, we might divide them into gay, into serious, into melancholy: Their character is so expressive, that lovers, in the East, employ their shades, to describe the different degrees of their passion. Nature makes frequent

use of it, relatively to us, with the same intention. When she wants to keep us at a distance from a marshy and unwholesome place, she scatters there poisonous plants, which present dingy colours, and offensive smells. There is a species of arum, which grows in the morasses of Magellan's Strait, whose flower exhibits the appearance of an ulcer, and exhales an odour so strong of putrid flesh, that the flesh fly resorts to it to deposit her eggs.

But the number of fetid plants is of no great extent. The Earth is clothed with flowers which, for the most part, have very pleasing hues and perfumes. I wish time would permit me to say something of the simple aggregation of flowers. This subject is so vast, and so rich, that I hesitate not to affirm, that it presents ample employment for the most famous Botanist in Europe, through his whole life, by discovering to him every day some new beauty, and that without removing above a league from his own habitation. All the art with which jewellers dispose their gems disappears before that which Nature displays in the assortment of flowers.

I shewed *J. J. Roussseau* the flowers of different trefoils, which I had picked up, as I was walking with him : Some of them were disposed in crowns, in half crowns, in ears, in sheaves, with colours endlessly varied. While they were yet on their stems, they had besides other aggregations, with the plants which were frequently opposed to them, in colours and in forms. I asked him, whether Botanists gave themselves any trouble about those harmonies : He told me no ; but that he had advised a young Painter, of Lyons, to learn Botany, with a particular view to study in it the forms and the assemblages of flowers ; and that he had thus become one of the most celebrated pattern drawers in Europe. On this subject, I quoted to him a passage from *Pliny*, with which he was highly delighted : It relates to a Painter of Sicily, named *Pausias*, who learned, by means of this study, to paint flowers at least as well as he of Lyons knew how to draw them : He had, in truth,

a master as skilful as Nature herself, or rather one and the same with her, namely, Love.

I shall give this story in the simplicity of style of the old Translator of *Pliny*, in order to preserve all its vivacity.* “ In his youth he became enamoured of a nosegay girl, of the same city with himself; her name was *Glycera*; she was very pretty, and had a singularly elegant taste in assorting, a thousand different ways, the flowers of nosegays and chaplets; so that *Pausias*, copying after Nature the chaplets and nosegays of his mistress, rendered himself, at length, perfect in that art. Last of all, he painted her seated, in the action of composing a chaplet of flowers; and this picture is considered as his great masterpiece: He called it *Stephano Plocos*, the garland weaver, because *Glycera* had no other means of relieving the pressure of poverty, but making and selling garlands and nosegays. And it is confidently affirmed, that *L. Lucullus* gave to *Dionysius*, of Athens, two talents, for a simple copy of this picture.”

This anecdote must have been singularly pleasing to *Pliny*, for he has repeated it in another place†: “ Those of Peloponesus,” says he, “ were the first who regulated the colours and the smells of the flowers of which chaplets were composed. It was, however, originally the invention of *Pausias*, a Painter, and of a nosegay girl, named *Glycera*, with whom he was violently in love; whence he was engaged to imitate to the life the chaplets and nosegays which she composed. But the girl varied in so many ways the arrangement of the flowers of her chaplets, in order to teaze and employ her lover, that it afforded very high amusement to behold the skill of the Painter *Pausias*, and the natural production of *Glycera*, striving for the superiority.

Ancient Nature is still better acquainted with the subject, than is the young *Glycera*. As it is impossible to

* *Pliny's Natural History*, book xxxv. chap. ii.

† *Idem*, book xxi. chap. ii.

follow her in her infinite variety, we shall make, at least, one observation respecting her regularity. It is this, that there is not any one odoriferous flower, but what grows at the foot of Man, or at least within reach of his hand. All those of this description are placed on herbage, or on shrubbery, as the heliotrope, the pink, the gilliflower, the violet, the rose, the lilach. Nothing similar to these grows on the lofty trees of our forests; and if some flowers of brilliant appearance are displayed on certain tall trees of foreign countries, such as the tulip tree, and the great chestnut of India, they have no very pleasant smell. Some trees of India, it is admitted, as the spice bearing plants, are perfumed all over; but their flowers are not very showy, and do not partake of the odour of their leaves. The flowers of the cinnamon tree smell like human excrement: This I know to be true by experience; if, however, the trees which were shewed to me in the Isle of France, in a plantation belonging to Mr. *Magon*, were the real cinnamon. The beautiful and fragrant flower of the magnolia grows on the lower part of the plant. Besides, the laurel which bears it is, as well as spice trees, a plant of no great elevation.

It is possible I may be mistaken in some of my observations; but supposing them multiplied, with respect to the same object, and attested by persons of veracity, and exempted from the spirit of system, I am able to deduce general consequences from them, which ought not to be a matter of indifference to the happiness of Mankind, by demonstrating to him the invariable intentions of benevolence in the AUTHOR of Nature. The varieties of their adaptation reflect mutual light; the means are different, but the end is constantly the same. The same goodness which has placed the fruit destined for the nourishment of Man, within reach of his hand, must have likewise disposed his nosegay with similar attention to his convenience. It may be here remarked, that our fruit trees are easily scaled, and different in this respect, from most forest trees.

Farther, all those which produce fruits that are soft, when in a state of perfect maturity, and which would have been liable to be bruised in falling, such as the fig tree, the mulberry, the plum, the peach, the apricot, present their crop at a small distance from the ground : Those, on the contrary, which yield hard fruit, and such as have nothing to risk from falling far, carry it aloft, as walnut trees, chestnuts and cocoas.

There is no less marvellousness of adaptation in the forms and sizes of fruits. Many of them are moulded for the mouth of Man, such as cherries and plums ; others for his hand, such as pears and apples ; others much larger, such as melons, have the subdivisions marked, and seem destined to be a social family repast : Nay, there are some in India, as the jacque, and with ourselves the pumpkin, large enough to be divided among a neighbourhood. Nature appears to have observed the same proportions in the various sizes of the fruits destined to the nutriment of Man, as in the magnitude of the leaves which are designed to afford him a shade in hot countries ; for of these some are contrived to be a shelter for a single person, others for a whole family, and others for all the inhabitants of the same hamlet.

I shall not dwell long on the other relations which plants have with the habitation of Man, from their greatness and their attitude, though many very curious observations might be suggested on that subject. There are few of them but what are capable of embellishing his field, his roof, or his wall. I shall only remark, that the vicinity of Man is beneficial to many plants. An anonymous missionary relates, that it is firmly believed by the Indians, that the cocoa trees which have houses around their roots, become much more beautiful than those where there are none ; as if that useful tree took delight in being near the habitation of Man.

Another missionary, a bare footed Carmelite, called Father *Philippe*, positively asserts, that when the cocoa tree

is planted close by houses or huts, it is rendered more fruitful by the smoke, by the ashes, and other circumstances connected with a human dwelling, so as to produce double the quantity of fruit. He adds, that, for this reason, the places in India which consist of palm plantations, are crowded with houses and little cabins; and that the proprietors of those plantations give, at first, a pecuniary premium, as an inducement to come and live there, together with part of the crop when it is reaped. He farther adds, that though their fruits, which are very large and hard, frequently fall down from the trees, when they have attained a state of full maturity, either by the gnawing of the rats, or by the violence of the winds, there is not a single instance known of any person's being hurt by the fall. This appears to me no less extraordinary than it did to him.*

I might extend the influences of Man to several of our fruit trees, especially the apple tree and the vine. I never saw finer apple trees in the *Païs de Caux*, than those which grow around the habitations of the peasantry. It is true that the attention of the proprietor may have greatly contributed to this. I have sometimes felt myself stopped in the streets of Paris, to contemplate with delight small vines, the roots of which are in the sand, and under the pavement, enriching with their clusters the complete front of a guard house. One of them, I think about six or seven years ago, produced two crops in one year, as was announced in the public prints.

* See Voyage to the East, of R. P. *Philippe*, a white friar, Book vii. chap. 5. section 4.

Animal Harmonies of Plants with Man.

But Nature was not satisfied with having given to Man a bower, and a carpet, loaded with fruit ; this would not have availed him, had she not likewise furnished him, in the vegetable order itself, the means of defence against the depredations of wild beasts. In vain would he have watched over the preservation of his property through the day, had it been exposed to pillage during the night. She has bestowed a prickly shrubbery to enclose him round and round. The farther we advance southward, we find the greater variety in the species of these. But, on the contrary, we see few, if any, of those thorny shrubs in the North, where they appear useless ; there being no orchards to defend. They seem to be produced, in both Indies, for every kind of situation. Though I have been only on the selvage, as I may say, of those countries, I have seen there a great number of such shrubs, the study of which presented a great variety of curious remarks to a Naturalist.

Among others, I took particular notice of one, in a garden on the Isle of France, which to me appeared proper for composing a fence impenetrable to the smallest of quadrupeds. It rises in form of a stake, about the thickness of a man's arm, quite straight, without branches, and bearing no verdure except a small bunch of leaves on its summit. Its bark is bristled all over with very strong, and very sharp prickles. It attains the height of seven or eight feet, and grows as thick above as below. A series of these shrubs, planted close to each other, would form a real palisado, without the smallest interval. The opuntia and the taper, so common under the Torrid Zone, are armed with prickles so keen, that they pierce the soles of your

shoes if you venture to walk over them. There is not a tyger, or lion, or elephant, that dares to approach them. There is another species of thorn, in the Island of Ceylon, which is employed as a defence against Man himself, accustomed as he is to force his way through every obstacle. *Robert Knox*, whom I have before quoted, informs us, that the avenues of the kingdom of Candy, in the Island of Ceylon, are blockaded only with faggots of those thorns, with which the inhabitants obstruct the passes of their mountains.

Man finds in vegetables, protection not only against ferocious animals, but against reptiles and insects. *Father du Tertre* tells us, that he one day found, in the Island of Gaudaloupe, at the foot of a tree, a creeping plant, the stem of which presented the figure of a serpent. But he was much more surprised on perceiving seven or eight snakes lying dead around it. He communicated this discovery to a medical man, who, by means of it, performed many wonderful cures, by employing it in the cases of persons bitten by those dangerous reptiles. It is generally diffused over the rest of the Antilles Islands, in which it is known by the name of snake wood. It is likewise found in the Eastindies. *John Hugo de Linfchotten* ascribes to it the same figure, and the same qualities.

We have, in our own climates, vegetables which present very strange correspondencies and contrasts with reptiles. *Pliny* tells us, that serpents are very fond of the juniper and the fennel, but that they are rarely found under the fern, the trefoil, the ash weed, and the rue; and that betony kills them. Other plants, as has already been mentioned, destroy flies, such as certain species of the dionæa. *Thevenot* assures us, that in the Indies, grooms defend their horses from the flies, by rubbing them every morning with the flowers of the pumpion. The fleabane, which bears black and shining grains, resembling a flea, clears the house of that vermin, if *Dioscorides* is to be credited. The echium, which has its seed formed like the head of a viper,

is fatal to those reptiles. It is probable, that, from such configurations, men, in the earlier ages of the World, discovered the relations and the oppositions between plants and animals. I am disposed to believe, that each genus of insect has its destructive vegetable with which we are unacquainted. In general, all vermin shuns perfume.

Nature has farther given us, in plants, the first patterns of nets for hunting and fishing. There grows on certain heaths in China, a species of ratan, so interwoven and so strong, as to catch and hold fast the stag, though in full vigour. I myself have seen on the sands of the sea shore in the Isle of France, a species of lianne, called the false potatoe, which covers whole acres, like a vast fishing net. It is so perfectly adapted to this very purpose, that the Negroes actually employ it in fishing. They form, with the stems and foliage of it, a very long series of cordages, which they cast into the sea; and having disposed them in a chain encompassing a great space on the water, they draw it ashore by the two extremities. They scarcely ever fail to bring out fish,* for the fishes are terrified, not only by a net which encloses them, but by every unknown substance which forms a shade on the surface of the water. By employing an industry equally simple, and nearly similar, the inhabitants of the Maldivia Islands carry on fisheries to a prodigious extent, employing no other means to decoy the fish into their receptacles, except a cord floating on the water, with the help of sticks.

Human, or elementary Harmonies of Plants.

There is not a single plant on the face of the Earth, but what has certain relations to the necessities of Man, and

* See Francis Pyrard's Voyage to the Maldivias.

which does not serve, somewhere or another, for clothing to him, for a shelter, for pleasure, for medicine, or, at least, for fuel. Some, which with us are entirely useless, are in high estimation in other parts of the World. The Egyptians put up frequent and fervent prayers for a plentiful crop of nettles, from the seeds of which they extract an oil, while the stem furnishes them with a thread, which they weave into excellent cloth. But those general relations, being innumerable, I shall confine myself to a few particular observations, respecting the plants which minister to the first of human wants, I mean the food of Man.

We remark, first, that corn, which serves for the general subsistence of the Human Race, is not produced by vegetables of a lofty stature, but by simple grasses. The principal support of human life is borne on herbage, and is exposed to the mercy of every breath of wind. There is reason to believe, that had we ourselves been intrusted with the safety of our crops, we would not have failed to place them on great trees; but in this, as well as in every thing else, we are bound to admire Divine Providence, and to mistrust our own wisdom. Had our harvests been the produce of the forests, in the event of these being destroyed by war, or set on fire through our own imprudence, or rooted up by the winds, or ravaged by inundations, whole ages would have been requisite to reproduce them in a country. Farther, the fruits of trees are much more liable to drop off, than the seeds of grasses. The grasses, as has been already observed, carry their flowers in an ear, in many cases surmounted by little beards, which do not defend their seeds from the birds, as *Cicero* says, but which serve, as so many little roofs, to shelter them from the water which falls from Heaven. The drops of the rain cannot drown them, as they do flowers radiated, in disks, in roses and in umbels, the forms of which, however are adapted to certain places and to certain seasons; but those of the grasses are adapted to every exposure.

When they are borne in flowing and drooping plumes, such as those of most grasses of hot countries, they are sheltered from the heat of the Sun; and when collected into an ear, as those of most grasses of cold countries, they reflect his rays on at least one side. Farther, by the suppleness of their stems, strengthened by joints from distance to distance, and by their filiform and capillaceous leaves, they escape the violence of the winds. Their weakness avails them more than strength does the great trees. Like small fortunes, they are resown and multiplied, by the very same tempests which lay waste the vast forests.

They farther resist the effect of excessive dryness by the length of their roots, which go, in quest of moisture, a great way under ground; and though their leaves are narrow, they have them in such numbers, that they cover the face of the ground with plants endlessly multiplied. At the slightest shower, you see them all rear themselves into the air, at their extremities, as if they were so many claws. They even resist conflagration, which consumes so many trees in the forest. I have seen countries in which they every year set the herbage on fire, in the season of drought, recover themselves, as soon as it rained, with the most lovely verdure. Though this fire be so active, as frequently to devour, root and branch, the trees which come into contact with it, the roots of herbage sustain no great injury from it.

They have, moreover, the faculty of reproducing themselves in three different ways, by shoots which push away from their roots, by creeping branches, which they extend to a distance, and by grains extremely volatile or indigestible, which the winds and the animals scatter about on every side. The greatest part of trees, on the contrary, naturally regenerate themselves only by their seeds. Add to the general advantages of grasses, an astonishing variety of characters, in their florification and in their attitudes, which renders them more proper than vegeta-

bles of every other class, to grow in every variety of situation.

It is in this cosmopolite family, if I may be allowed the expression, that Nature has placed the principal aliment of Man; for the various species of corns, on which so many human tribes subsist, are only so many species of grasses. There is no land on the Globe where some kind of corn or another may not be raised. *Homer*, who had studied Nature so accurately, frequently characterizes each country by the vegetable peculiar to it. One island he celebrates for its grapes, another for its olive trees, a third for its laurels, and a fourth for its palms; but to the Earth only he gives the general epithet of *Zeîdωρα*, or corn giving. Nature, in fact, has formed it for growing in all situations, from the Line to the very border of the Frozen Ocean. One species is adapted to the humid places of warm countries, as the rice of Asia, which grows in vast abundance in the muddy swamps by the side of the Ganges. Another is suited to the marshy grounds of cold countries; such is a kind of false oats, which naturally grows on the banks of the rivers of North America, and of which many savage Nations annually raise immense crops.*

Other kinds of corn thrive wonderfully well on warm and dry lands, as the millet and the pannick of Africa, and the maize of Brasil. In our climates, wheat agrees best with a strong soil, rye with a sandy one, buckwheat with rainy declivities, oats with humid plains, barley with stony ground. Barley succeeds in the very bosom of the North. I have seen, as far up as the sixty first degree of North Latitude, amidst the rocks of Finland, crops of this grain as beautiful as ever the plains of Palestine produced.

Corn affords an abundant supply to all the necessities of Man. With its straw he enjoys the means of

* Consult Father *Hennepin*, a Franciscan; *Champlain*, and other Travelers through North America.

lodging, of covering, of warming himself, and of feeding his sheep, his cow and his horse; with its grain he can compound aliments and liquors of every flavour. The northern Nations brew it into beer, and distil from it strong waters, more potent than those from wine; such are the distillations of Dantzick. The Chinese* extract from rice, a wine as agreeable as the best wines of Spain. The Brasilians prepare their *ouicou* with maize. In a word, with oats torrefied, it is possible to compose a cream which shall have the perfume of the vanilla. If we unite with these qualities those of the other domestic plants, most of which likewise grow all over the Earth, we shall find in them the flavour of the clove, of pepper, of other spices; and without going farther than our own gardens, we shall be able to collect the delicacies scattered over the rest of the vegetable Creation.

We may distinguish, in the barley and the oats, the elementary characters which have been formerly indicated, and which vary the species of plants of the same genus, in a conformity to the situations where they are designed to grow. The barley destined to dry places has leaves broad and open at their base, which convey the rain water to the root of the plant. The long beards which surmount the coat that is wrapped round the grain, are bristled with denticulations, very much adapted to the purpose of making them adhere to the hair of animals, and of resowing them in lofty and dry situations. The oats, on the contrary, destined to humid places, have narrow leaves, gathered close around the stem, in order to intercept the rain water. The coats of this plant distended, similar to two long half bladders, and not very closely adhering to the grain, render it proper for floating, and crossing the water by the help of the winds. But here we are presented with a still more wonderful fact, which will confirm what has been advanced, respecting the uses of the differ-

* Journey to China, by I/brand Ides.

ent parts of plants, relatively to the elements, and which extends the views of Nature even beyond the fructification, though we have considered this as the determining character; it is, that barley, in rainy years, degenerates into oats, and that oats, in dry seasons, change into barley.

This observation, related by *Pliny*, *Galen* and *Mathiola*, the Commentator of *Dioscorides*,* has been confirmed by the experiments of several modern Naturalists. *Mathiola*, indeed, alleges, that this transformation of barley is not into oats properly so called, which he denominates *Bromos*, but into a plant which, at first sight, resembles it, and to which he gives the name of *Ægilops*. This transformation, demonstrated by the frequently repeated experiments of the husbandmen of his country, and by that which the father of *Galen* made, expressly for his own satisfaction; together with that of the flowers of the linarium, and of the leaves of many vegetables, are sufficient proof, that the elementary relations of plants, are only secondary relations, and that animal, or human, relations are the primary. Thus, Nature has placed the character of a plant, not only in the form of the fruit, but in the substance of that very fruit.

Hence I presume, that having formed, in general, of a mealy substance, the basis of human life, Nature has diffused it over all situations, on different species of grasses; that afterwards, intending to add to this, certain modifications relative to some humors of the human temperament, or to some influence of season, or of climate, she has formed other combinations of it, which she has deposited in leguminous plants, such as pease and beans, which the Romans comprehended in the class of corn plants; that, finally, she has formed another sort of it, which she has laid up in the fruits of trees, such as chestnuts, or in roots,

* See *Mathiola* on *Dioscorides*, book iv. page 432.

as potatoes, and other farinaceous under ground vegetables.

Those adaptations of substance to every climate are so infallibly certain, that, in every country, the fruit which is most common there is the best, and the most wholesome. Hence I farther presume, that she has followed the same plan with respect to medicinal plants; and that having diffused over various families of vegetables, virtues relative to our blood, to our nerves, to our humours, she has modified them in every country, conformably to the diseases which the climate of each particular country generates, and has placed them in opposition with the particular characters of those same diseases. It is, in my opinion, from the neglect of these observations, that so many doubts and disputes have been excited respecting the virtues of plants. A simple, which, in one country, is an infallible cure for a malady, may, sometimes increase it in another. The Jesuits powder, which is the pounded bark of a species of fresh water manglier of Mexico, is a remedy for the fevers of America, of a kind peculiar to damp and hot situations, but frequently fails when applied to those of Europe. Every medicine is modified according to the place, just as every malady is.

I shall pursue this reflection no farther, as it would lead me into a deviation from my subject; but if Physicians would pay the attention to it which it merits, they must study more carefully the plants of their own country, and not prefer to them, as they generally do, those of foreign climates, which they are under the necessity of modifying a thousand different ways, in order to give them, as chance may direct, an adaptation to local maladies. One thing is certain, namely, that when Nature has determined a certain favour in any vegetable, she repeats it all over the Earth, with a variety of modifications, which do not, however, prevent our distinguishing its principal virtue. Thus, having placed the *cochlearia* (scurvy grafs) that powerful antiscorbutic, even on the foggy shores of Spitz-

bergen, she has repeated the favour and the medicinal qualities of it, in the cresses of our brooks, in the garden cresses, in the nasturtium, which is a cress of the rivers of Peru; in a word, in the very grains of the papaya, which grows in humid places of the Antilles Islands. We find, in like manner, the favour, the smell, and the medicinal qualities of our garlick, in the woods, the barks, and the mosses of America.*

* I must here observe that garlic, the smell of which is so formidable to our fine ladies, is, perhaps, the most infallible remedy in the World against the vapours, and all the nervous disorders to which women are so subject. Of this I have had repeated experience. Nay, *Pliny* goes so far as to assure us, that it is a cure for the epilepsy. It is, besides, an antiseptic; and every plant which has its smell, has also the same virtues. It is very remarkable, that plants which smell like garlic, usually grow in marshy places, as a remedy, provided by Nature, against the putrid emanations thence exhaled. Such is, among others, the *scordium*. *Galen* relates, that its antiseptic virtue became demonstrable from this, that after a battle, the dead bodies which happened to be in contract with plants of the *scordium*, were found to be in a much less putrid state than those which were not; and that those bodies remained fresh and sound chiefly in the parts which actually touched the plant. But the experiment which the Baron *Busbequius* made with it, upon living bodies, is still more striking. That great Man, on his return from the first journey which he made to Constantinople, was attended by a numerous retinue. A Turk of his suite was attacked with the plague and died. His companions resolutely divided his spoils among themselves, in defiance of the remonstrances of the Physician *Busbequius*, who assured them that the pestilence would thereby be immediately communicated. In fact, a few days after, the symptoms of that dreadful malady became apparent among them.

But let us permit the intelligent and virtuous Ambassador himself to give an account of the consequences of this alarming event. "The day after our departure from Adrianople," says he, "they all came to him (the Physician) with a sad and dejected air, complaining of a violent headache, and imploring relief. They were perfectly sensible that they were affected with the first symptoms of the pestilence. My Physician reprimanded them severely, saying he was astonished how they dared to apply to him for a remedy from an evil of which he had forewarned them, and which they had obstinately persisted in bringing upon themselves. Not, however, that he intended to withhold any assistance which might be in his power. On the contrary, he became extremely uneasy about the means of relieving them: But where was the possibility of finding medicine on a road frequently subjected to a failure of the most com-

These considerations induce me to believe, that the elementary characters of plants, and their entire configuration, are only secondary means, and that their principal character is referrible to the necessities of Man. Thus, in order to establish in plants an order simple and agreeable, instead of running over successively their elementary, vegetable, animal, and human harmonies, it would be more proper to invert this order, but without changing it, and to set out with the plants which present to Man a supply for his first wants, to proceed thence to the uses which animals derive from them, and to conclude with the situations which determine their varieties.

This order may be followed so much the more easily, that the first point of departure is fixed by the smell and the taste. The testimony of these two senses is far from being contemptible; for they assist us in ascertaining the intimate qualities of plants, much better than the decompositions of Chemistry; it may be extended to the whole

“mon necessities of life? Providence became our only refuge, and we were effectually succoured in this trying hour. I am going to relate in what manner.

“It was my custom on our arrival at the different halting places on the road, to go a walking in the vicinity, and to take a view of every thing curious. That day I was so fortunate as to bend my course to an adjacent meadow. My eye happened to catch sight of a plant with which I was unacquainted; I picked up some of its leaves, and put them to my nose: They smelled of garlic. I handed them to my physician, asking him if he knew the plant. After having attentively examined it, he replied that it was the scordium. He lifted up his hands to Heaven, and gave thanks to God for the seasonable relief which He had sent us. He instantly gathered a considerable quantity, put it into a large kettle, and boiled it thoroughly. Then, calling for the patients, desired them to take courage, and, without the loss of a moment, made them drink copiously of the decoction of that plant, with a slight infusion of the earth of Lemnos: He then had them well warmed, and put to bed, desiring them not to go to sleep till they had fallen into a profuse perspiration, with which they exactly complied. The next day they felt themselves greatly relieved. A similar dose was repeated, and the whole ended in a perfect cure. Thus, through the goodness of God, we escaped a death which stared us immediately in the face.” (*Letters of the Baron Bussy-quius*, vol. i. page 197 and 198.)

vegetable kingdom, inasmuch as there is not a single genus of plants, varied into umbelliferous, rose formed, papilionaceous, and the rest, but what presents food to Man, in some part or another of the Globe. The ciperus of Ethiopia bears, at its root, bulbs which have the taste of almonds. That which in Italy is called *Traf* produces bulbs which taste like chestnuts.* We have found, in America, the potatoe in the class of *solana*, which are poisons. It is a jasmine of Arabia, which supplies us with the coffee berry. The eglantine, with us, produces berries fit only for the use of birds; but that of the Land of Yesso, which grows there among rocks, and the shells on the sea shore, bears cups so large and so nourishing, that they serve for food to the inhabitants of those shores, for a considerable part of the year.† The ferns of our hills are unproductive; but there grows in North America a species of this plant, called *Filix baccifera*, loaded with berries, which are very good to eat.‡ The tree itself of the Molucca Islands, called *Libbi* by the inhabitants, and palm sago by travellers, is, in the judgment of our Botanists, merely a fern. This fern contains in its trunk the sago, a substance lighter, and more delicate than rice. In a word, there are even certain species of sea weed, which the Chinese eat with delight, among others, those which compose the nests of a species of swallow.

By disposing in this order, therefore, the plants which produce the principal subsistence of Man, as the grasses, we should have, first, for our own country; the wheat of strong lands, the rye of the sands, the barley of the rocks, the oats of humid places, the buck wheat of rainy declivities; and for other climates and exposures, the pannic, the millet, the maize, the Canadian oats, the rice of Asia,

* See the Catalogue of Garden Plants of Boulogne, by *Hyacinth Ambrosino*.

† Consult Collection of Voyages by *Thevenot*.

‡ See Father *Charlevoix*, his History of New France.

some species of which thrive in dry situations; and so of the rest.

It would be farther useful to ascertain on the Globe the places to which the several origin of each alimentary plant might be referred. What I have to advance on this subject may be conjecture merely, but it appears to me to have an air of probability. I am of opinion, then, that Nature has placed in islands the species of plants which are most beautiful, and best adapted to the necessities of Man. First, islands are more favourable to the elementary expansions of plants, than the interior of continents, for there is no one but what enjoys the influences of all the elements, being completely surrounded by the winds and the seas, and frequently in its interior, possessing the combined advantages of plains, of sands, of lakes, of rocks and of mountains. An island is a little world in epitome. Secondly, their particular temperature is so varied, that you find of them in all the principal points of Longitude and Latitude, though there be a considerable number still unknown to us, particularly in the South Seas. Finally, experience demonstrates, that there is not a single fruit tree in Europe, but what becomes more beautiful in some of the islands along its coasts, than in the Continent.

I have spoken of the beauty of the chestnut trees of Corsica and Sicily: But *Pliny*, who has preserved to us the origin of the fruit trees which were in Italy in his time, informs us, that most of them had been imported from the islands of the Archipelago. The walnut came from Sardinia; the vine, the fig tree, the olive, and many other fruit trees, were natives of the other islands of the Mediterranean. Nay, he observes, that the olive tree, as well as several other plants, thrives only in the vicinity of the Sea. All modern travellers confirm these observations. *Tavernier*, who had so many times traversed the Asiatic Continent, assures us, that no olive trees are to be seen beyond Aleppo. An anonymous English traveller, whom

I have already quoted with approbation, positively asserts, that no where, on the Continent, are there to be found fig trees, vines, mulberries, as well as many other fruit trees, once to be compared, either as to magnitude or fertility, with those of the Archipelago, notwithstanding the carelessness and indolence of the wretched possessors. To these I might add a great many other vegetables, which thrive only in those islands, and which furnish to the commerce of Europe, gums, mannas, and dye stuffs. The apple tree, so common in France, produces no where such fine fruit, and of species so varied, as on the shores of Normandy, under the breath of the sea breeze from the West. I have no doubt that the fruit which was proposed as the prize of beauty had, like *Venus* herself, some favourite isle.

If we carry our remarks even into the Torrid Zone we shall find that it is neither from Asia, nor from Africa, that we obtain the clove, the nutmeg, the cinnamon, the pepper of the best quality; the benzoin, the sandal wood, the sago and many others, but from the Molucca Islands, or from those which are in the same seas. The cocoa tree attains its perfect beauty only in the Maldivia Islands. Nay, there are, in the archipelagos of those Seas, a great number of fruit trees described by *Dampier*, which have not yet been transplanted into the Old Continent; such as the grape tree. The double cocoa is to be found only in the Sechelles Islands. The islands recently discovered in the South Sea, such as that of Taïti, have presented us with trees hitherto unknown, as the bread fruit, and the mulberry tree, the bark of which serves to make cloth. As much may be said of the vegetable productions of the Islands of America relatively to their Continent.

These observations might be extended even to the very birds and quadrupeds, which are more beautiful, and of species more varied, in islands, than any where else. The elephants held in highest estimation in Asia, are those of the Island of Ceylon. The Indians believe them to be

possessed of something divine; nay, more, they allege, that other elephants acknowledge this superiority. One thing is certain, they fetch a higher price all over Asia than any others. In a word, travellers the most worthy of credit, and who have made the most accurate observations, as the English *Dampier*, Father *du Tertre*, and some others, assure us, that there is not a shallow in the seas lying between the Tropics, but what is distinguished by some sort of bird, of crab, of turtle, or of fish, which is no where else to be found, either of species so varied, or in so great abundance. I presume that Nature has thus scattered her choicest benefits over the islands, in order to allure men thither, and to pervade the Earth. These are only conjectures, I grant; but they rarely deceive us when they are founded on the wisdom and goodness of the AUTHOR of Nature.

The finest species of corn, therefore, which is wheat, might be referred to Sicily, where, in fact, they pretend it was originally found. Fable has immortalized this discovery, by making that island the scene of the amours of *Ceres*; as well as the birth of *Bacchus*, in the Isle of *Naxos*, because of the beauty of its vines. This much is certain, that corn is no where indigenous but in Sicily, if, however, it still reperpetuates itself there spontaneously, as the Ancients affirm.

After having determined in the same manner, the other human accommodations of the grasses to different situations of ground, we might examine the grasses which exhibit marked relations to our domestic animals, such as the ox, the horse, the sheep, the dog. We might characterize them by the names of these animals. We should have the *gramen bovinum, equinum, ovinum, caninum*. The different species of each of these genera, might afterwards be distinguished by the names of the different places where they are found by the several animals; on the banks of rivers, among rocks, on sands, on mountains; so that by the addition of the epithets, *fluviale,*

saxatile, arenosum, montanum, you might supply, in two words, all the verbose phraseology of our botanical compositions.

We might apportion, in like manner, the other grasses, to the different quadrupeds of our forests, as to the stag, to the hare, to the wild boar, and so on. These first determinations would require certain experiments to be made on the tastes of animals, but they would be very instructive, and highly amusing. They would have no mixture of cruelty, as most of those of our modern physics have, by which the wretched animal is flead alive, poisoned, or suffocated, in order to come at the knowledge of its propensities. Our experiments would study their appetites only, and not their convulsions. Besides, there are a great many of those preferred and rejected plants, already well known to our shepherds. One of them shewed me, in the vicinity of Paris, a gramineous plant, which fattens sheep more in a fortnight, than the other species can do in two months. The moment, too, that they perceive it, they run after it with the utmost avidity. Of this I have been an eye witness. I do not mean, however, to assert that each species of animal limits its appetite to a single species of food. It is quite sufficient, in order to establish the order which I am proposing, that each of them gives, in every genus of plant, a decided preference to some one species; and this is confirmed, beyond all doubt, by experience.

The great class of the gramineous plants being thus apportioned to Man and animals, other plants would present still greater facility in their appropriations, because they are much less numerous. Of the fifteen hundred and fifty species of plants, enumerated by *Sebastian le Vaillant* in the country adjacent to Paris, there are more than a hundred families, among which that of the grasses comprehends, for its share, eightyfive species, exclusive of twenty six varieties, and our different sorts of corns. It is the most numerous next to that of mushrooms, which con-

tains a hundred and ten species, and that of mosses, which contains eightyfix. Thus, instead of the systematic classification of botanic Writers, which gives no explanation of the uses of most of the vegetable parts, which frequently confounds plants the most heterogeneous, and separates those of the same genus, we should have an order simple, easy, agreeable, and of an infinite extent, which passing from Man to animals, to vegetables, and to the elements, would discover to us the plants which serve to our use, and to that of other sensible Beings, would render to each of them its elementary relations, to each site on the Earth its vegetable beauty, and would replenish the heart of Man with admiration and gratitude. This plan appears so much the more conformable to that of Nature, that it is entirely comprehended in the benediction which its AUTHOR pronounced upon our first parents, saying unto them :* “ Behold, I have given unto you every
 “ herb bearing seed, which is upon the face of all the
 “ Earth, and every tree, in the which is the fruit of a
 “ tree yielding seed, *after its kind*: To you it shall be for
 “ meat : And to every beast of the Earth, and to every
 “ fowl of the air, and to every thing that creepeth upon
 “ the Earth, wherein there is life, I have given every
 “ green herb for meat.”

This benediction is not confined, as far as Man is concerned, to some primordial species in each genus. It is extended to the whole vegetable kingdom, which converts itself into aliment fit for his use, by means of the domestic animals. *Linnaeus* has presented to them, from the eight to the nine hundred plants which Sweden produces, and he remarked that, of these, the cow eats two hundred and eightyfix ; the goat, four hundred and fiftyeight ; the sheep, four hundred and seventeen ; the horse, two hundred and seventyeight ; the hog, one hundred and seven. The first animal refuses only one hundred and eightyfour

* Genesis, chap. i. ver. 29, 30.

of them; the second, ninety two; the third, one hundred and twelve; the fourth, two hundred and seven; the fifth, one hundred and ninety. In these enumerations he comprehends only the plants which those animals eat with avidity, and those which they obstinately reject. The others are indifferent to them. They eat them when necessity requires, and even with pleasure, when they are tender. Not one of them goes to waste. Those which are rejected by some, are a high delice to others. The most acrid, and even the most venomous, serve to fatten one or another. The goat browses on the ranunculus of the meadow, though hot as pepper, on the tithymal and the hemlock. The hog devours the horsetail and henbane. He did not put the ass to this kind of proof, for that animal does not live in Sweden, nor the rein deer, which supplies the want of him to so much advantage in northern regions, nor the other domestic animals, such as the duck, the goose, the hen, the pigeon, the cat and the dog.

All these animals united, seem destined to convert to our advantage every thing that vegetates, by means of their universal appetites, and especially by that inexplicable instinct of domesticity which attaches them to Man; whereas no art can communicate it either to that timid animal the deer, nor even to some of the smaller birds, which seek to live under our protection, such as the swallow, who builds her nest in our houses. Nature has bestowed this instinct of sociability with Man, only on those whose services might be useful to him at all seasons; and she has given them a configuration wonderfully adapted to the different aspects of the vegetable kingdom.

I say nothing of the camel of the Arabian, which can travel under a load, for several days together, without drinking, in traversing the burning sands of Zara; nor of the rein deer of the Laplander, whose deeply cleft hoof can fasten, and run along, on the surface of the snow; nor of the rhinoceros of the Siamese and of the Peguan, who,

with the folds of his skin, which he can distend at pleasure, is able to disengage himself out of the marshy grounds of Siriam; nor of the Asiatic elephant, whose foot, divided into five ergots, is so sure on the steep mountains of the Torrid Zone; nor of the lama of Peru, who, with his forked feet, scrambles over the rocky heights of the Cordeliers. Every extraordinary situation is maintaining for Man a useful and commodious servant.

But without removing from our own hamlets, the single hoofed horse pastures in the plains, the ponderous cow in the bottom of the valley, the bounding sheep on the declivity of the hill, the scrambling goat on the sides of the rocks; the hog, furnished with a proboscis, rakes up the morafs from the bottom; the goose and the duck feed on the fluviatric plants; the hen picks up every grain that was scattered about, and in danger of being lost in the field; the four winged bee collects a tribute from the small dust of the flowers; and the rapid pigeon hastens to save from loss the grains which the winds had conveyed to inaccessible rocks. All these animals, after having occupied through the day the various sites of vegetation, return in the evening to the habitation of Man, with bleatings, with murmurings, with cries of joy, bringing back to him the delicious produce of the vegetable creation, transformed, by a process altogether inconceivable, into honey, into milk, into butter, into eggs, and into cream.

I take delight in representing to myself those early ages of the World, when men travelled over the face of the Earth, attended by their flocks and herds, laying the whole vegetable kingdom under contribution. The Sun, going before them, in the Spring, invited them to advance to the farthest extremities of the North, and to return with Autumn bringing up his train. His annual course in the Heavens seems to be regulated by the progress of Man over the Earth. While the Orb of Day is advancing from the Tropic of Capricorn to that of Cancer, a traveller departing on foot from the Torrid Zone, may

arrive on the shores of the Frozen Ocean, and return thence into the Temperate Zone, when the Sun traces backward his progress, at the rate of only four, or, at most, five leagues a day, without being incommoded, the whole journey through, with either the sultry heat of Summer, or the frost of Winter. It is by regulating themselves according to the annual course of the Sun, that certain Tartar hordes still travel.

What a spectacle must the virgin Earth have presented to its first inhabitants, while every thing was as yet in its place, and Nature not yet degraded by the injudicious labours, or the desperate madness of Man!! I suppose them taking their departure from the banks of the Indus, that land which is the cradle of the Human Race, on a progress northward. They first crossed the lofty mountains of Bember, continually covered with snow, which, like a rampart, encompasses the happy land of Cachemire, and separate it from the burning kingdom of Lahor.* They presented themselves to their eyes like vast amphitheatres of verdure, clothed, to the South, with all the vegetables of India, and, to the North, with all those of Europe. They descended into the vast basin which contains them, and there they beheld a part of the fruit trees which were destined one day to enrich our orchards. The apricots of Media, and the peach trees of Persia, skirted, with their blossoming boughs, the lakes, and the brooks of living water which bedew their roots. On leaving the evergreen valleys of Cachemire, they quickly penetrated into the forests of Europe, and went to repose under the foliage of the stately beech and tufted elm, which had as yet shaded only the loves of the feathered race, and which no Poet had hitherto sung. They crossed the boundless meadows which are washed by the Irtis, resembling Oceans of verdure, here and there diversified with long beds of yellow lilies, with stripes of ginzang, and tufts of broad leaved

* Consult *Bernier's Description of the Mogul Country.*

rhubarb. Following the track of its current, they plunged into the forests of the North, under the majestic branches of the fir, and the moving foliage of the birch.

What smiling valleys opened to their view, along the river's side, and invited them to deviate from the road, by promising them objects still more lovely ! What hills enamelled with unknown flowers, and crowned with ancient and venerable trees, endeavoured to persuade them to proceed no farther ! Arrived on the shores of the Icy Sea, a new order of things arose to view. There was now no more night. The Sun encompassed the Horizon round and round ; and the mists, dispersed through the air, repeated, on different planes, the lustre of his rays in rainbows of purple, and parhelions of dazzling radiance. But, if the magnificence of the Heavens was multiplied, desolation covered the face of the Earth. The Ocean was hoary with mountains of floating ice, which appeared in the Horizon like towers and cities in ruin ; and on the land, nothing to be seen, in place of groves, but a wretched shrubbery blasted by the winds, and instead of verdant meads, rocks clothed with moss. The flocks which had accompanied them must there undoubtedly have perished ; but even there Nature had still made provision for the necessities of Man. Those shores were composed of massy beds of coal.* The seas swarmed with fishes, and the lakes with fowls. They must find, among the animal tribes, servants and assistants : The reindeer appeared in the middle of the mosses : She presented to those wandering families, the services of the horse in her agility, the fleece of the sheep in her fur ; and shewing them, like the cow, her four teats, and but one nursing, she seemed to tell them that she was destined, like her, to share her milk with mothers oppressed by a too numerous offspring.

But the East must have been the part of the Globe which first attracted the attention of Mankind. That

* Professor Gmelin's Journey to Siberia.

place of the Horizon where the Sun arises, undoubtedly fixed their wondering eyes, at a period when no system had interposed to regulate opinion. On seeing that great Luminary arising, from day to day, in the same quarter of the Heavens, they must have been persuaded that he there had a fixed habitation, and that he had another where he set, as a place of rest. Such imaginations, confirmed by the testimony of their eyes, were, it must be admitted, natural to men destitute of experience, who had attempted to erect a tower which should reach to Heaven, and who, even in the illumination of more scientific ages, believed, as a point of religion, that the Sun was drawn about in a chariot by horses, and retired every evening to repose in the arms of *Thetis*. I presume, they would be determined to go in quest of him rather toward the East than toward the West, under the persuasion that they would greatly abridge their labour, by advancing to meet him.

It must have been this conviction, I am disposed to think, which left the West, for a long time, in a deserted state, under the very same Latitudes which, in the East, were swarming with inhabitants, and which first sent men in crowds toward the eastern part of our Continent, where the earliest and most populous Empire of the World, that of China, was formed. What confirms me farther in the belief, that the first men, who advanced toward the East, were engaged in this research, and were in haste to reach their object, is this, that having taken their departure from India, the cradle of the Human Race, like the founders of other Nations, they did not, like them, people the Earth progressively, as Persia, Greece, Italy and Gaul, were successively, in a westerly direction; but leaving desert the vast and fertile countries of Siam, of Cochinchina, and of Tonquin, which are to this day half barbarous and uninhabited, they never gave up the pursuit till they were stopped by the Eastern Ocean; and they gave to the islands which they perceived at a distance, and on which

they did not for a long time, acquire the skill to land, the name of *Gepuen*, which we have transformed into Japan, and which, in the Chinese language, signifies, birth of the Sun.

Father *Kircher* * assures us, that when the first Jesuit Astronomers arrived in China, and there reformed the Calendar, the Chinese believed the Sun and the Moon to be no bigger than they appear to the eye ; that, on setting, they retired to a deep cave, from which they issued next day at the time of rising ; and, finally, that the Earth was a plane and smooth surface. *Tacitus*, who has written History with such profound judgment, does not deem it to be beneath him, in that of Germany, to relate the traditions of the western Nations, who affirmed, that toward the Northwest was the place where the Sun went to bed, and that they could hear the noise which he made on plunging into the waves.

It was from the quarter of the East, then, that the Orb of Day first attracted the curiosity of Mankind. There were, likewise, tribes which directed their course toward that point of the Globe, taking their departure from the southern part of India. These advanced along the peninsula of Malacca ; and, familiarized with the Sea, which they coasted most of the way, they were induced to form the resolution of availing themselves of the united accommodation which the two elements present to travellers, by navigating from island to island. They thus pervaded that vast belt of islands, which Nature has thrown into the Torrid Zone, like a bridge intersected by canals, in order to facilitate the communication of the two Worlds. When retarded by tempests, or contrary winds, they drew their barks ashore, cast a few seeds into the ground, reaped the crop, and deferred their reembarkation till fairer weather, and a season more favourable, encouraged them to venture forth.

* See China illustrated, chap. ix.

Thus it was that the early mariners performed their voyages, and that the Phenicians, employed by *Necho*, King of Egypt, made the circuit of Africa in three years, departing by way of the Red Sea, and returning by the Mediterranean, according to the account given of it by *Herodotus*.*

The first Navigators, when they no longer saw islands in the Horizon, paid attention to the seeds which the Sea cast upon the shore of those where they were, and to the flight of the birds which were withdrawing from it. On the faith of these indications, they directed their course toward lands they had never yet seen. Thus were discovered the immense Archipelego of the Moluccas, the Islands of Guam, of Quiros, of the Society, and, undoubtedly, many others which are still unknown to us. There was not one but what invited them to land, by presenting some attractive accommodation. Some stretched out along the waves like Nereïds, poured from their urns, rills of fresh water into the Sea: It was thus that the Island of Juan Fernandez, with its rocks and cascades, presented itself to Admiral *Anson*, in the midst of the South Sea. Others, on the contrary, in the same Ocean, having their centres sunk, and their extremities elevated, and crowned with cocoa trees, offer to their canoes basons at all seasons tranquil, swarming with fishes and sea fowls: Such is that known by the name of *Woesterland*, or the Land of Water, discovered by the Dutch Navigator *Schouten*. Others, in the morning, appeared to them, in the bosom of the azure main, all over irradiated with the light of the Sun, as that one of the same Archipelago which goes by the name of *Aurora*. Some announce themselves in the darkness of night, by the flames of a volcano, as a pharos blazing aloft amidst the waters, or by the odoriferous emanations of their perfumes.

There was not one of them of which the woods, the hills, and the downs, did not maintain some animal, natur-

* Herodotus, book iv.

ally familiar and gentle, but which becomes savage only from the cruel experience which it acquires of Man. They saw fluttering around them, as they disembarked on their strands, the silken winged birds of paradise, the blue pigeons, the cacatoës all over white, the lauris all over red. Every new island tendered them some new present ; crabs, fishes, shells, pearl oysters, lobsters, turtles, ambergris ; but the most agreeable, beyond all doubt, were the vegetables. Sumatra displayed, on her shores, the pepper plant ; Banda, the nutmeg ; Amboyna, the clove ; Ceram, the palm sago ; Florés, the benzoin and sandal wood ; New Guinea, groves of cocoa trees ; Taïti, the bread fruit. Every island arose in the midst of the Sea, like a vase which supported a precious vegetable. When they discovered a tree laden with unknown fruit, they gathered some branches of it, and ran to meet their companions with shouts of joy, exhibiting to them this new benefit bestowed by Nature.

From those early voyages, and from those ancient customs it is, that there has been diffused, over all Nations, the practice of consulting the flight of birds before engaging in any enterprize, and that of going to meet strangers, with the branch of a tree in the hand, in token of peace, and of joy at sight of a present from Heaven. These customs still exist among the islanders of the South Sea, and among the free tribes of America. But not fruit trees alone fixed the attention of the first Men. If some heroic action, or some irreparable disaster, had excited admiration, or inspired regret, the tree adjoining was ennobled by it. They preferred it, with those fruits of virtue or of love, to such as produced food or perfume. Thus, in the islands of Greece and of Italy, the laurel became the symbol of triumph, and the cypress that of eternal sorrow. The oak supplied crowns of undecaying honour to the well deserving citizen, and simple grasses decorated the brows of the men who had saved their country. O Romans ! people worthy of the Empire of the World, in that you

opened to every one of your subjects the career of virtuous exertion, and culled the most common plants of the field to serve as the badge of immortal glory, that a crown for the head of virtue might be found on every spot of the Globe.

From similar attractions it was, that, from island to island, the Nations of Asia made their way to the New World, where they landed on the shores of Peru. Thither they carried the name of children of that Sun whom they were pursuing. This brilliant chimera emboldened them to attempt the passage to America. It was not dissipated till they reached the shores of the Atlantic Ocean; but it diffused itself over the whole Continent, where most of the Chiefs of the Nations still assume the title of Children of the Sun.*

* I do not mean to affirm, however, that America was peopled only from the islands of the South Sea. I believe that a passage was opened into it, likewise, by the North of Asia and of Europe. Nature always presents to Mankind different means for the attainment of the same end. But the principal population of the New World came from the islands of the South Sea. This I am able to prove by a multitude of monuments still existing, and to the most remarkable of which I shall confine myself. It is demonstrated, then, by the worship of the Sun, established in India, in the islands of the South Sea, and in Peru, as well as by the title of Suns, or Children of the Sun, assumed by many families of those countries; by the traditions of the Caribs scattered over the Antilles, and in Brasil, who give themselves out as originally from Peru; by the very establishment of that Monarchy of Peru, as well as that of Mexico, situated on the western coast of America, which looks toward the islands of the South Sea, and by the populousness of their Nations, which were much more considerable, and more polished than those which inhabited the eastern coasts, which supposes the former to be of a much higher antiquity; by the prodigious diffusion of the Taitian language, the different dialects of which are spread over most of the islands of the South Sea, and of which words innumerable are to be found in the language of Peru, as has lately been proved by a gentleman of great learning, and even in that of the Malays in Asia, some of which I myself was able to distinguish, particularly the word *maté* which signifies to kill; by the practices common and peculiar to the Nations of the Peninsula of Malacca, of the islands of Asia, of those of the South Sea and of Brasil, which are not the inspiration of Nature, such as that of making fermented and intoxicating liquors, and of chewing herbs and roots; by the channels of the com-

Mankind, encompassed with so many blessings, continues to be wretched. There is not a single genus of animal but what lives in abundance and liberty, the greatest

merchandise of antiquity which flowed in this direction, such as that of gold, which was very common in Arabia and in the Indies, in the time of the Romans, though there be very few mines of that metal in Asia; but above all, by the trade of emeralds, which must have run in that track from remote antiquity, in order to reach the Old Continent, where no mine of that gem is to be found. Hear what is said on this subject by *Tavernier*, who is worthy of credit when he speaks of the commerce of Asia, especially as it relates to jewels. "It is an error of long standing," says he, "which many persons have fallen into, to believe that the emerald was found originally in the East. Most jewellers, on first looking at a high coloured emerald, are accustomed to say, this is an Oriental emerald. But they are mistaken, for I am well assured, that the East never produced one, either on the Continent, or in its islands. I have made accurate enquiries into this, in all the voyages I made." He had travelled six times by land through India. Hence it must be concluded, that the so highly valued emeralds of the ancients, came to them from America, through the islands of the South Sea, through those of Asia, through India, the Red Sea, and, finally, through Egypt, from whence they had them.

To this may be objected the difficulty of navigating against the regular easterly winds, in order to pass from Asia to America, under the Torrid Zone; but, relatively to this subject, I shall repeat, that the regular winds do not blow there from the East, but from the Northeast and Southeast, and depend so much the more on the two Poles, the nearer you approach toward the Line. This oblique direction of the wind was sufficient for persons who navigated from island to island, and who had contrived barks the least liable to deflection, such as the double proas of the Isles of Guam, the form of which seems to have been preserved in the double balsaes of the coast of Peru. *Schouten* found one of those double proas sailing more than six hundred leagues from the Island of Guam toward America. Besides, it appears, likewise, that the South Sea has its monsoons, which have not hitherto been observed. Hear the remarks made, on the variation of those winds, by an anonymous English Navigator, who sailed round the World, with Sir *Joseph Banks* and Mr. *Solander*, in the years 1768, 1769, 1770 and 1771, page 83. "The inhabitants of Otaheite, trade with those of the adjacent islands which lie to the eastward, and which we had discovered on our passage. During three months of the year, the winds which blow from the West quarter are very favourable to them for carrying on this traffic." Admiral *Anson* likewise met with winds from the West, in those Latitudes, which retarded him.

Certain Philosophers explain the correspondencies to be found between the inhabitants of the islands and those of Continents, by supposing islands

part without labour, all at peace with their species, all united to the objects of their choice, and enjoying the felicity of perpetuating themselves by their families; whereas more than the half of Mankind is doomed to celibacy. The other half curses the bands which have matched him. The greater part tremble at the thought of rearing a progeny, under the apprehension of being incapable to find subsistence for them. The greater part, in order to procure subsistence for themselves, are subjected to painful labours, and reduced to the condition of slaves to

to be lands once united to the Continent, but now swallowed up by the Ocean, the summit only, and a few of the inhabitants upon it, remaining above the water. But enough has been already said in this Work, to evince that maritime islands are not fragments separated from the Continent; and that they have mountains, peaks, lakes, hills, proportionable to their extent, and directed to the regular winds which blow over their seas. They have vegetables peculiar to themselves, and which no where else attain the same degree of beauty. Farther, had those islands formerly constituted part of our Continent, we should find in them all those of our quadrupeds which are to be met with in all climates; there were no rats nor mice in America, and in the Antilles, previous to the arrival of the Europeans, if we may believe the testimony of the Spanish Historian *Herrera*, and of Father *dù Tertre*. We should, likewise, have found in them the ox, the ass, the camel, the horse, but they contained none of these animals; but plenty of our common poultry, ducks, dogs, swine, as well as among the Islanders of the South Sea, who themselves had no other of our domestic animals. It is obvious that the first animals, such as the horse and the cow, being of a bulk and weight too considerable, could not possibly, be their utility ever so great, cross the seas in the small canoes of the early Navigators, who, on the other hand, would have been very careful not to transport with them such vermin as rats and mice.

Finally, let us revert to the general Laws of Nature. If all the islands of the South Sea once formed a Continent, there must have been no sea, then, in the space which they occupy. Now, it is indubitably certain, that were you, at this day, to take away from around them, the Ocean by which they are encompassed, and the regular winds which blow over it, you would blast them with sterility. The islands of the South Sea form, between Asia and America, a real bridge of communication, with a few arches alone of which we are acquainted, and of which it would not be difficult to discover the rest, from the other harmonies of the Globe. But here I restrain my conjectures on this subject. I have said enough to prove, that the same hand which has covered the Earth with plants and animals for the service of Man, has not neglected the different parts of his habitation.

to their fellow creatures. Whole Nations are exposed to perish by famine : Others, destitute of territory, are piled a top of each other, while the greatest part of the Globe is a wilderness.

There are many lands which never have been cultivated ; but there is not one, known to Europeans, which has not been polluted with human blood. The very solitudes of the Ocean gulp down into their abysses, vessels filled with men, sunk to the bottom by the hands of men. In cities, to all appearance so flourishing by their arts and their monuments, pride and craft, superstition and impiety, violence and perfidy, are in a state of incessant warfare, and keep the wretched inhabitants in perpetual alarm. The more that society is polished in them, the more numerous and cruel are the evils which oppress them. Is the industry of Man there exerted, only because he is there most miserable ? Why should the Empire of the Globe have been conferred on the single animal which had not the government of its own passions ? How comes it that Man, feeble and transitory, should be animated by passions at once ferocious and generous, despicable and immortal ? How is it that, born without instinct, he should have been able to acquire such various knowledge ? He has happily imitated all the arts of Nature, except that of being happy. All the traditions of the Human Race have preserved the origin of these strange contradictions ; but Religion alone unfolds to us the cause of them. She informs us that Man is of a different order from the rest of animals ; that his reason perverted has given offence to the AUTHOR of the Universe ; that as a just punishment, he has been left to the direction of his own understanding ; that he is capable of forming his reason only by the study of universal reason, displayed in the Works of Nature, and in the hopes which virtue inspires ; that by such means alone he can be enabled to rise above the animal, beneath the level of which he is sunk, and to reascend,

step by step, along the steepy declivity of the celestial mountain from which he has been precipitated.

Happy is he, in these days, who, instead of rambling over the World, can live remote from Mankind ! Happy the man who knows nothing beyond the circumference of his own Horizon, and to whom even the next village is an unknown land ! He has not placed his affections on objects which he must never more behold, nor left his reputation at the mercy of the wicked. He believes that innocence resides in hamlets, honour in palaces, and virtue in temples. His glory and his religion consist in communicating happiness to those around him. If he beholds not in his garden the fruits of Asia, or the shady groves of America, he cultivates the plants which delight his wife and children. He has no need of the monuments of Architecture to dignify and embellish his landscape. A tree, under the shade of which a virtuous man is reclined to rest, suggests to him sublime recollections ; the poplar in the forest recalls to his mind the combats of *Hercules* ; and the foliage of the oak reminds him of the crowning garlands of the Capitol.

THE E N D.

PRINTED AT WORCESTER, MASSACHUSETTS,
BY THOMAS, SON & THOMAS.

... common from which we have been prevented.

the World can live more from Mind than from Matter. Happiness is not in things, but in the mind which sees things as they are.

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